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THE DARK ROOM AND ITS EQUIPMENT.

BY AN OLD HAND.

THE ARRANGEMENT OF THE DARK ROOM OR LABORATORY—PRINT-WASHING—ACCESSORIES.

THE "dark room," as it is generally called, is somewhat of a misnomer, the word "laboratory" being much preferable, for the amount of light admitted to this so-called dark room may be sufficient to enable the operator to see comfortably over the whole place and yet be perfectly safe; that is, not affecting the sensitive surfaces with which he has to deal, unless they are very unnecessarily exposed to its influence. It may be borne in mind that *no light* is absolutely safe for an unlimited period. Sensitive plates and papers should never be exposed to it more than is absolutely necessary; this matter has been already referred to in treating of lanterns. The conditions required for constructing a "dark" room are, first of all: convenience in size and design, good ventilation, and thorough protection from any white or actinic light when desired. The photographic dark room bears the same relation to the studio and the rest of the premises as the kitchen does to the ordinary dwelling house: or rather the dark room is to the photographer as kitchen to the cook. It is true all sorts of holes and corners have been used as "dark rooms," but are makeshifts at best; good work may be done in them, and frequently is, on the same principle that a good workman will make good work under almost any disadvantages, but this is no argument in favour of the makeshift. Where opportunity offers, no trouble should be spared to make this portion of the photographer's premises as perfect and convenient as possible.

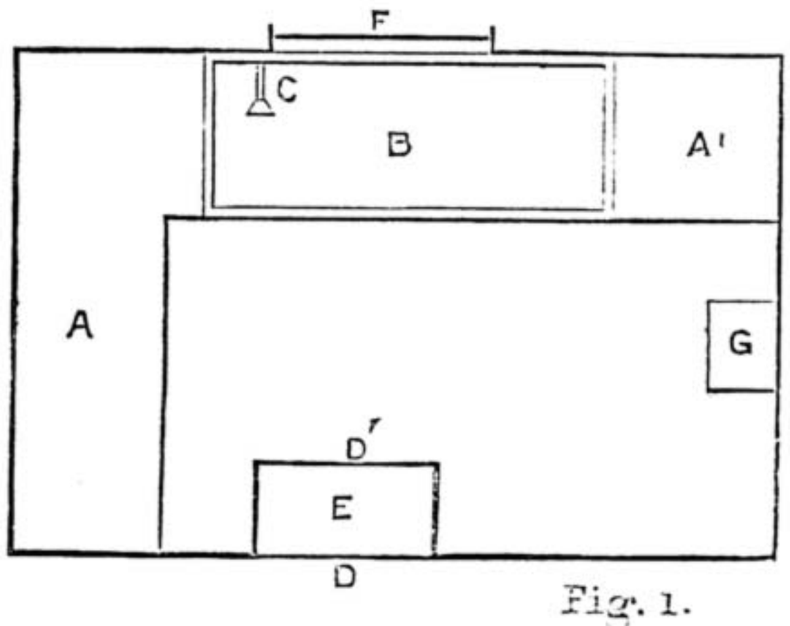
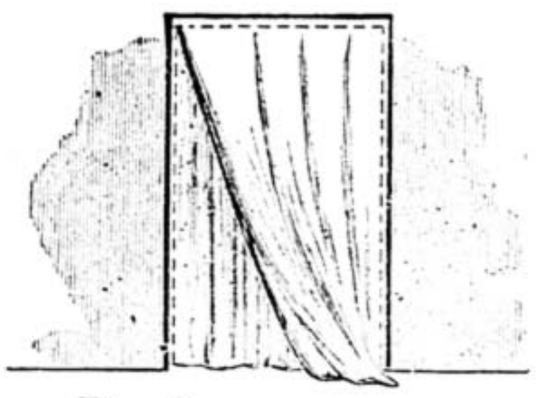


Fig. 1.



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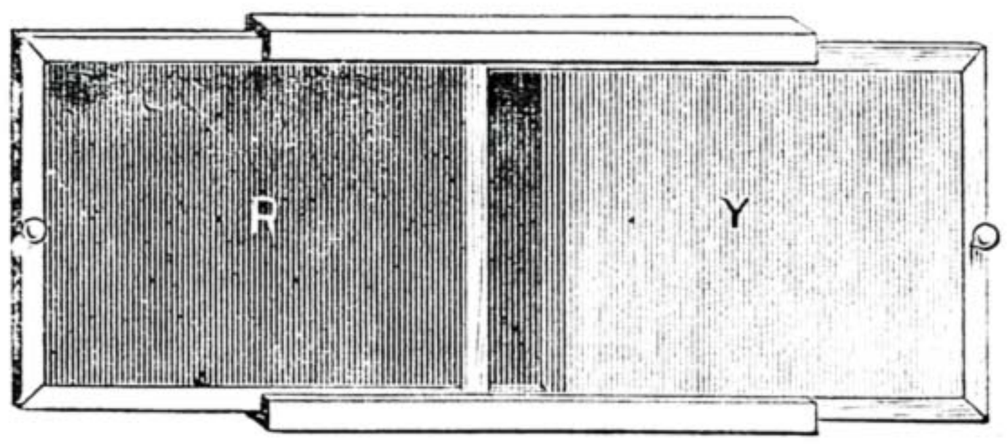

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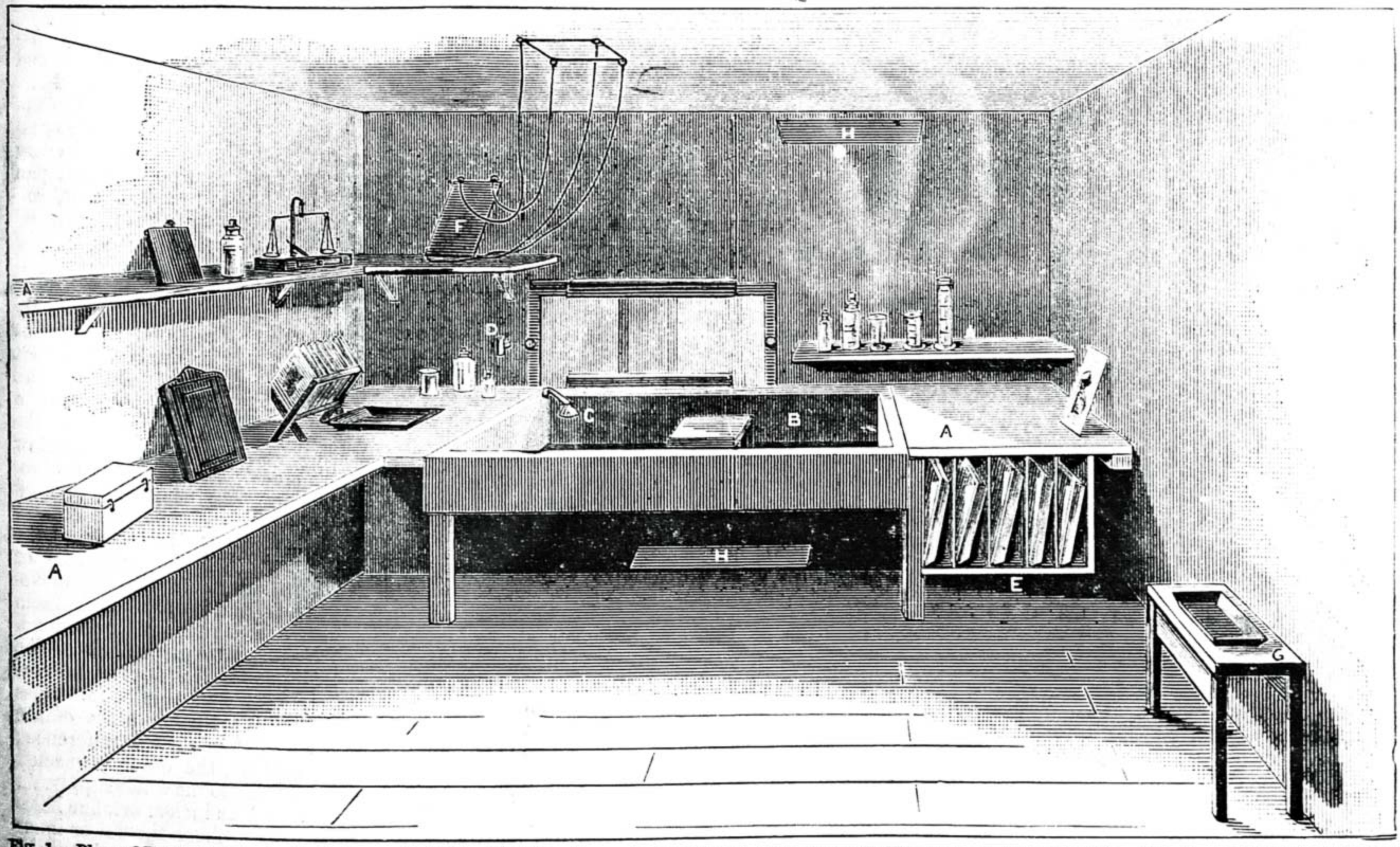

Fig. 1.—Plan of Dark Room—A, A′, Shelves; B, Sink; C, Water Tap: D, D′, Doors; E, Lobby; F, Window; G, Small Table. Fig. 2.—Curtains over Doors. Fig. 3.—Sliding Sashes in Coloured Glass. Fig. 4.—Interior of Dark Room—A, A, A, A, Shelves; B, Sink; C, Water Tap; D, Gas Tap; E, Shelf with Partitions for Dishes; F, Oscillating Table; G, Small Table for Hypo. Dish; H, H, Trapped Ventilators.

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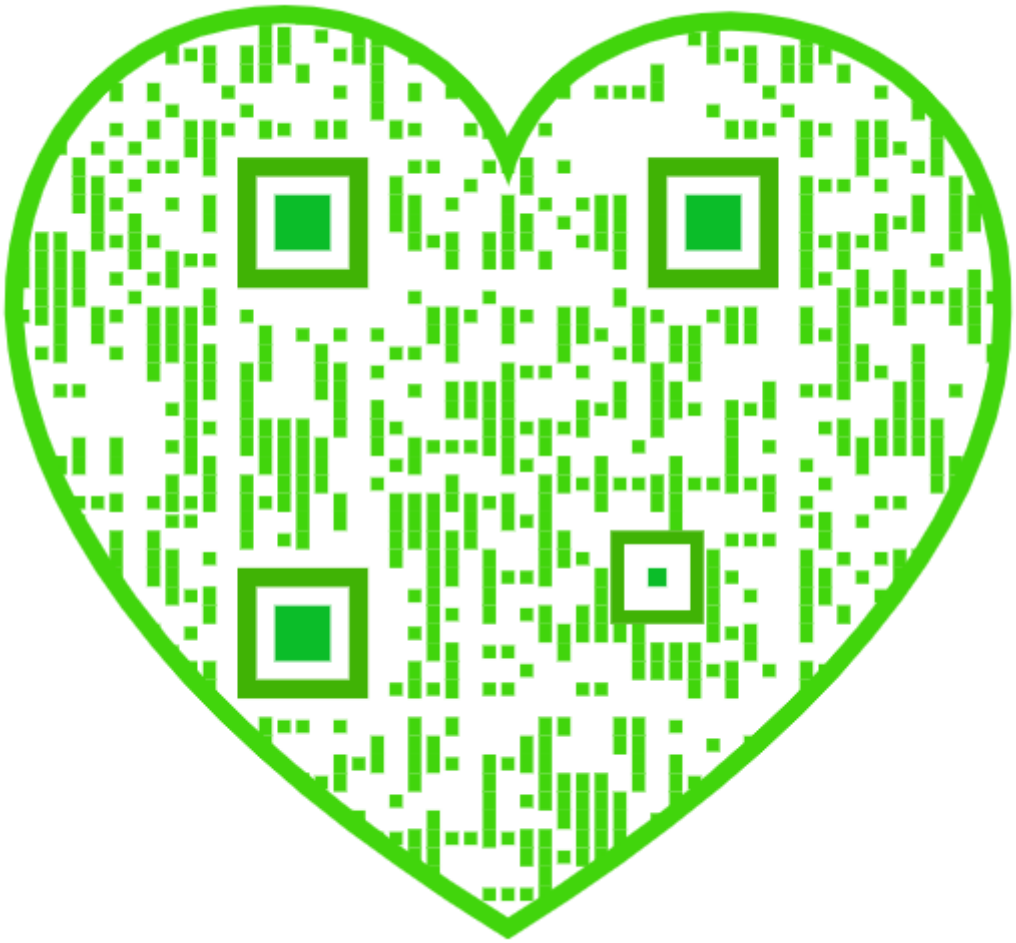


The area of such a workroom should be sufficiently large to contain two persons at the same time, with plenty of elbow room. This I consider the smallest space that can be fairly designated as convenient; but if the size is that of an ordinary sitting-room, so much the better. The larger the place the more healthful and pleasant it is to work in.

Let us suppose we have a space at command of about 8 ft. by 6 ft., which we will now proceed to fit up. The ground plan (Fig. 1) shows the disposition of the window, door, sink, and shelves. The door must either be doubled, or covered with double curtains, impervious to light. The doors, D and D′, being double, should have a short lobby, E, between them, that may either project into the dark room, or, if there is sufficient space, extend outwardly, a hinged rod connecting the two, preventing both doors being opened at the same time. The edges of the door should be made to fit into a deep felt-lined rebate, so that when closed they are absolutely light tight. If a single door is used, one opaque curtain is fastened securely along the top and down the side, the other being also fastened along the top and down the opposite side, taking care they are sufficiently voluminous to permit easy passage between them (as in Fig. 2); these curtains take the place of the outer door. B is a lead-lined wooden sink, 4 ft. long, and 2 ft. wide, and 9 in. deep; A, A′ are shelves, A being 3 ft. wide and the whole width of the room, A′ being the width of the sink, grooved and sloping gradually to it, so that any fluid may drain into the sink, filling in the space between the sink and wall. F is the window, consisting of a grooved frame that is glazed with white glass, and in which other frames filled with orange or ruby glass, or other non-actinic material, can be slipped at will (Fig. 3). The light is preferably a gas jet *outside* the room, regulated by a tap on the inside. Of course daylight *may* be used; but, owing to its fluctuating character, is not to be recommended; C is the water tap with rose, from which the water flows on its being pulled forward. A narrow shelf is fixed against the wall over the sink, for any measures, bottles, etc., that may be required. Another shelf at a distance of 2 ft. above the lower one is convenient, and a roller towel hung behind the door. Brown or yellow varnished paper should cover the walls and ceiling, as less likely to retain dust and dirt, and can be readily cleaned with a damp cloth. In Fig. 4, the general appearance of such a room is given. Placed in the sink are one or more small movable platforms, on which to place dishes and bring them under the tap at will; to the right, below the sink, is a shelf divided into cells for the purpose of storing developing dishes and trays. In front of the window and screwed to the ceiling are four eyes, from which an oscillating table is suspended, such as described in a previous chapter, and which in the diagram is represented placed out of the way on a shelf. The door should be provided with the means of securing it on the inside. The fewer the bottles, jars, or other articles (than those required for daily use) stored in the dark room the better. There should be a place for everything required, and everything in its place, so that even in total darkness they can be found at once. This methodical arrangement is of much more importance now, in these days of plates and papers of such exalted sensitiveness, than when only wet collodion was used; in fact, when working orthochromatic plates only the merest glimmer of deep ruby light is permissible, and very little of that, if we expect to produce bright, clear negatives. With regard to temperature of the room, it should never be below 60° Fahr., or above 70° Fahr. The hyposulphite fixing bath is best placed on a stand separate (Fig. 4) from any of the shelves or sink, and let the dish or dipping bath be used for nothing else, when it has once been devoted to this purpose. Contamination with hyposulphite of soda is a fruitful source of stains and trouble; after touching it, the hands should always be rinsed and wiped before proceeding with any other operation. It is convenient if the bottles containing the accelerators or restrainers are of different shapes, for labels soon get partially or wholly obliterated. Once get accustomed to a particular shaped bottle for a solution, and there is very little probability of using the wrong one. This may be an apparently trifling matter, but the advantage of adopting it will be soon appreciated.

Print-washing.—One of the most important processes in the preparation of silver prints is that by which they are freed from the hyposulphite compounds formed during the fixing; very many kinds of washing tanks have been devised for this purpose. We will select two: one of which is suitable for small quantities of prints, and the other for larger numbers. Fig. 5 represents one of the smaller kind, and consists of a circular vessel with a false bottom and syphon attached, in order that the contaminated water may be periodically drawn off, the supply coming from a series of small jets near the top of the pan. The force of the supply and the angle at which the jets are set cause a continuous circular movement in the water, that prevents the prints sticking together, and thoroughly cleanses them from those hyposulphite compounds that, suffered to remain in the prints, would destroy their permanency. Usually this washing pan is made of zinc, but glazed earthenware is frequently substituted, and answers the purpose thoroughly well. The pan being provided, proceed to drill a hole about an inch from the bottom, into which fasten a bent syphon tube A, the bend being about 2 in. from the top of the pan; compo gas-piping answers every purpose. If the pan is made of zinc, soldering is the method used to make the attachment; but if earthenware, a cork ring is most easily adapted; various methods will suggest themselves; the idea is to have a syphon outside the pan, to draw off the water from below the false bottom (Fig. 6). This drainer is made of a perforated zinc disc supported on three short legs, just above the outflow of the syphon; the reason for having the syphon outside is, that any roughness or projection inside interferes with the movement of the prints, and is apt to make them clot together and escape that thorough cleansing so essential to permanency. The supply pipe (Fig. 7) is the next consideration. This is best made of ½-in. brass tubing, bent to follow the curvature of the pan for about a third of the circumference; one end is stopped up, the other connected by indiarubber tubing to the water supply. At a distance of about ½ an inch apart, fine holes are drilled in a line along the lower inner side of the tube. When the water is turned on, it issues through these small holes with

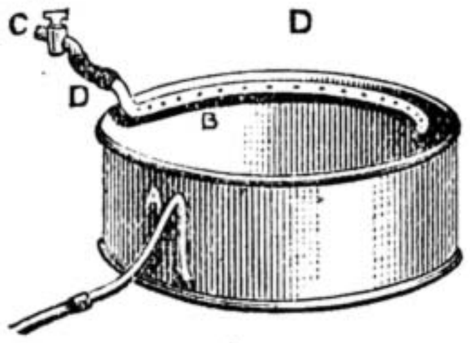


Fig. 5.

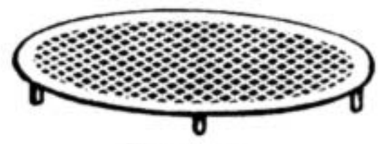
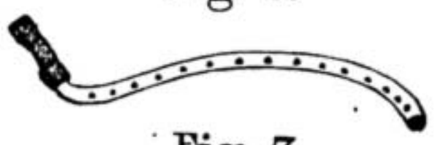


Fig. 6.



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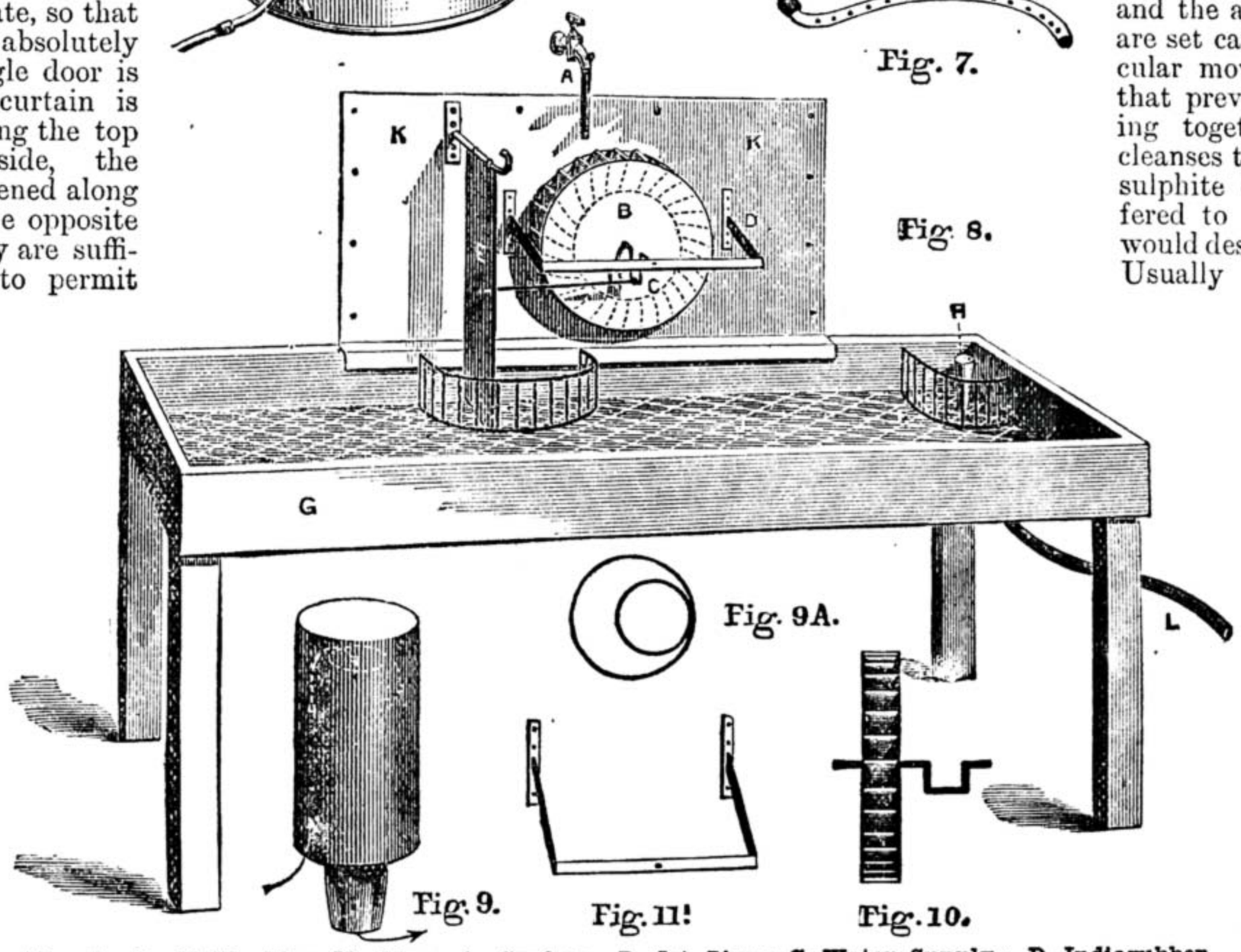

Fig. 8.

Fig. 9A.

Fig. 9.

Fig. 11.

Fig. 10.

Fig. 5.—Small Washing Machine—A, Syphon; B, Jet Pipe; C, Water Supply; D, Indiarubber Connection. Fig. 6.—False Bottom of Perforated Zinc. Fig. 7.—Brass Perforated Jet Pipe. Fig. 8.—Large Washing Machine—A, Water Supply; B, Water Wheel; C, Crank; D, Support; E, Paddle; F, F, Cage; G, Tank; H, Water Plug; J, False Bottom of Perforated Zinc; K, K, Zinc Sheet to protect Wall from Water; L, Wash Pipe. Fig. 9.—Waste Plug. Fig. 9 A.—Diagram showing how Plugs are Soldered together. Fig. 10.—Water Wheel and Crank. Fig. 11.—Iron Frame to support Axle of Wheel.

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considerable force, striking the water in the pan at a sharp angle, so that it and the prints are driven round and round during the time the water is allowed to flow; as soon as it rises above the bend in the syphon, the pan begins to empty, and continues to do so until the discharge is completed, when it again fills. This is automatically repeated during the time the water is flowing into it. The rapidity of the process depends on the size of the syphon and force of the water supply. It does not require to be very rapid; a syphon of ⅜ tube is quite large enough, the supply of water being regulated accordingly.

An arrangement for large numbers, or large prints, is shown in Fig. 8; it consists of a slate trough, 8 ft. long by 3 ft. wide, and 8 in. deep, with a false bottom of perforated zinc, made in sections for convenience of removal for cleansing. A syphon plug (Fig. 9) is adjusted in one corner. This plug is made of a short tube, one end of which fits into an aperture in the bottom of the trough, the upper end being about an inch and a half below the upper edge. This is surrounded by a case open at both ends, the upper end being an inch or so above the plug, and the lower half an inch above the bottom of the trough; when in position they are fastened together by solder. It will be seen by this contrivance that the impure water from the bottom of the tank is carried off, whilst the supply of fresh comes in at the top, thus setting up a continuous and thorough circulation. The method of keeping the prints from sticking together is by gently agitating the water by means of a paddle attached to a small water wheel (Fig. 10); a brass wire cage prevents the prints getting torn by contact with the paddle. In this arrangement no syphon is used, the quantity of water being considerable, and being steadily renewed the whole of the time is considered equivalent. If it is thought desirable to heat the water, hot-water pipes can be arranged below the false bottom. I may here mention that in all apparatus in which zinc is likely to come in contact with the silver print, the prints should be washed face upwards, for however well the zinc may be varnished or protected at first, the coating very soon partially wears off; but by keeping the *face* of the prints from lying in contact with the unprotected metal, no harm will happen.

Accessories.—Under this head is comprised almost everything that is used for pictorial effect in conjunction with the figure; it will be therefore out of the question to enumerate them. We will therefore in a great measure limit our remarks to a few of those things it is better to avoid. We will at once say, that anything that has an unreal appearance in the picture is bad, and that a theatrically made-up look is the bane of portraiture; both faults are so easily avoided, that it only proclaims the uncultivated taste of the photographer if he indulges in them. The inconsistent mixture of wild mountainous or other landscape scenery with fashionable upholstering and carpeted foreground is most absurd. The bizarre and extraordinary designs of studio furniture, such as are never seen in an ordinary household, are other objectionable points in the matter of accessories. The only deviation from the usual every-day style of furniture is, that it should not be polished; let it be chosen for chaste, elegant, or solid design, and the seats of the chairs not provided with springs, but merely firmly stuffed. The rest may be left to the good taste of the user; baskets, fans, and good artificial flowers will be found useful. Ferns and palms in vases are very effective. Curtains of rich material and Japanese screens are frequently admirable aids to composition. Having thus given a passing mention of a few of the most generally useful accessories, it may be left to the individual to select such things as will be most in accordance with his or her taste, and in harmony with the subject that has to be photographed.

THE BROOCH: HOW TO MAKE IT.

BY H. S. GOLDSMITH.

Catches of Brooches.

I THINK I said that a brooch tongue was but a piece of wire soldered on to a piece of tube, and with very few exceptions this is the case. Now that we are dealing with catches, they can be just as easily defined as some kind of hook, so shaped that it will retain the tongue in its position, and yet allow of its withdrawal easily.

You will see by glancing at the diagrams that the forms vary considerably; but throughout the lot the principle that is defined above is there. They are all hooks of one kind or another.

Now, undoubtedly, the main thing is that we obtain some piece of metal bent round in the form of a hook; and if our business did not (and rightly) lay claim to being an artistic one, I should be the last to desire anything more than mere utility. Neither should I bother about giving a good shape to this or anything else; but the whole *raison d'être* of our productions is that they shall give pleasure as ornaments, and to do that all the details should be carried out in the best way we know of, artistic as well as mechanical, even down to the catch, which is seen by nobody but the wearer.

To begin, as usual, with the simplest and most general forms, such as Fig. 1, A and B, we notice that the shape is a nice C scroll, or rather should be, of the shape of diagrams. But if you will take notice of the next dozen brooches you see, I feel pretty sure that four or five out of the dozen will be rather like the carelessly made ugly thing sketched in Fig. 1, D.

Perhaps it will not be wasted time if we consider the way to make them properly. It is but the same old story of beginning at the beginning: thus it is the *ends* of the wire or whatever you are using that have to be turned first—and it is the very end I mean that has to be bent; ⅛ of an inch from the end will not do unless you are going to be content with a wretched article like Fig. 1, D. When the ends are properly curved it is easy enough to get the other part into shape.

This ordinary catch is really so simple that I feel almost inclined to apologise for the foregoing; but it is these details that help so much in the style or character of the work—hence all this writing.

There is just a word more: and that is, don't get it too high. There is no actual need for the curls to be wider apart than just to let the tongue pass easily in and out. You will see what I mean by Fig. 1, C, where I have drawn the tongue in section in several places.

Also note that both ends are thinned down, both to improve the shape, and at the top end to facilitate the tongue's entry and exit.

The next sort I have sketched are examples of spring catches. They really ought to be called safety catches; but the custom of the trade decrees that "safety" is the word to be used when "protecting" catches are what is actually meant.

In Fig. 2, A and B, you see there is a spring acting against the lower part of the top curl of the catch, which is prolonged as much as possible, in order not to let the tongue drop down below it, and also to give an unmistakable lead when it is desired to unfasten the brooch.

Of these two, the first one (Fig. 2, A) is most decidedly the better, for this reason, viz., that the spring is a separate piece of gold, therefore you can make it of any quality you think best, and you can hammer it as much as ever you like; while if it is soldered like Fig. 2, B, there is the chance of breaking it off, besides the greater difficulty of getting it hard enough to act as a spring.

This separate spring in Fig. 2, A, is fixed in its place by a pin or screw passing through it; or you might pewter-solder it in its place.

Just a word or two about pewter-solder. Now I daresay in the course of these papers that I shall occasionally speak of its employment; but you must understand that it is not to be used as a rule for ordinary work—not even for repairs if it is possible to avoid it. It is a bad sign when it is always, or even often, used.

In this case, if sparingly, neatly, and cleanly employed, it is all right. But if not, then it but proves the rule against its use; and the fellow that slobbers his work all over with "soft tommy" as a regular thing, had better go and be a tinker at once, then perhaps he will have enough of pewter-soldering.

I think that I may say without exaggeration that, as a rule, double the quantity of pewter-solder is used more than is actually required to do the work it is wanted to do. But enough for the present on that matter. I daresay that I shall have to return to it later on.

Safety catches—that is, catches that protect the point of the tongue—are made as you see from the diagrams, Fig. 3, A, B, C, D, E, F, G, and Fig. 4, A, B, C, from both flat metal and from wire.

Every one is a means of guarding the point of the tongue, and so are Fig. 5, A, B, C, D. In Fig. 3, F′, is given the shape plate out of which Fig. 3, F, is made.

Fig. 3, E, F, and Fig. 4, B, are used for narrow bar brooches, and to show their width you will please refer to the next illustration for each, namely, Fig. 3, E′, F′, and Fig. 4, B′. Fig. 6 is shown as a type of ancient Etruscan work. There are a few in the British Museum of these fibulæ; and in my outline drawing, you may perhaps notice that the protective catch is very much there. As a rule these are beautifully ornamented with fine wire and small grains of gold; but sufficient for our present purpose is shown in the diagram.

Safety-pin brooches, as they are called, are now, and have been for some time, very fashionable. You will find but one in its entirety (Fig. 5, A), for it is of no use taking up space by drawing the joint ends to each when they are all alike—except that some make them with three instead of the usual two turns.

Fig. 5, A′, is the side view of the catch of Fig. 5, A. It is the neatest of all, and is mostly used in the best houses here in London—at least, I think it is.

Fig. 5, B, C, D, are simply different ways of forming them.

The last one (Fig. 5, E) is put in as a horrible example of how not to do it; and I should

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not have thought of introducing such a scarecrow but that I came across it as I was drafting this paper; and it had on its front a diamond beetle worth, I should say, about £15. Why, the one with the five turns (Fig. 5, C) is infinitely better, and that is one of the same pattern as they use in hospitals, etc., for it is the safety-pin (*i.e.* the non-scratching pin) of surgical practice that gives the name to this class of ornament, and may account for the double-barrel name—pin and brooch—that it bears.

Fig. 7, A and B, is the most usual way of arranging a fall-down catch. The catch is simply soldered on to a joint in such a manner that it can move about the quarter of a circle—that is, from its proper upright position to one where it lays down close to the back of the brooch. To prevent the catch falling *outwards* a stop is formed, either by the catch itself (Fig. 7, A) or by soldering a grain of gold to the side of the joint, which does quite as well. The method shown, however, keeps the work more compact, for the grain of gold would only be used when the catch is soldered on top of the joint. This is the catch I should use with any of the removable tongues I spoke about in my paper on Joints.

Fig. 8 is a slide arrangement, to catch the end of the tongue. It is shown open, with the tongue in position, while the dotted lines indicate its position when closed.

This is but one of the different forms that have been introduced from time to time, and the only one I have seen with a date, which is registered June 19th, 1848, and has the initial punch of G. U. as well. My Birmingham readers, and I daresay many in London as well, will recognise it as that of George Unite & Sons, a well-known firm of silversmiths.

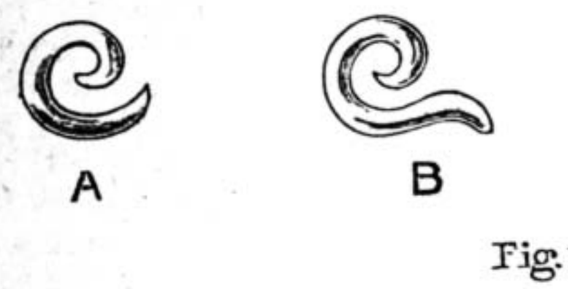
Several others have been made, some with a spring attached to the movable piece, but none seem to have obtained much favour; at least, one meets them but rarely, and then it is to find that they have been patented or registered. What is the reason of this scarcity? Is it the excessive royalty demanded, or the difficulty of finding the maker? or the fact that the simple scroll catch does not get out of order? Be the reason what it may, the fact remains that none of these strange arrangements have "caught on," as the Americans say.

Fig. 9, the lyre shape, is a clip catch that one can occasionally use to fasten scarf-brooches and ear-ring hooks. I know scarf-brooches are old-fashioned, but some customers will have their work done that way. And to steady the brooch, this shape catch is easier to adjust than the C shape, but does not hold so well, of course.

You see how it works. The two horns or ends act as springs to some slight degree, and retain the wire—clipped in between them—steady, but hardly secure.

The next paper to this will be on the positions that joints, tongues, and catches are to be placed, and in other papers which I trust will appear at some future time, I hope to take up some other of the numerous details of our business.

But with the article next to come, which will be a paper on brooch mounts, my instructions on brooch making will be complete. It will be noticed that my papers on this subject have been arranged in a systematic manner, so as to embrace the various details, and to touch on each and all in the order in which the workman would naturally have his attention drawn to them when engaged in the manufacture of this article. Thus the method employed in making the tongues of brooches was first dealt with, then the joints of brooches, and thirdly, in the present paper, the catches, a piece of curled metal on the under part of the brooch, used as a means of holding and retaining the tongue after it has been passed through the material to be fastened together by the brooch.



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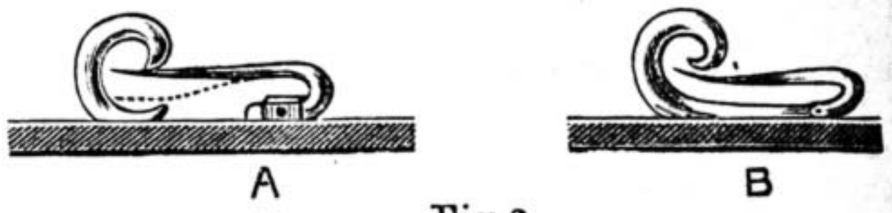

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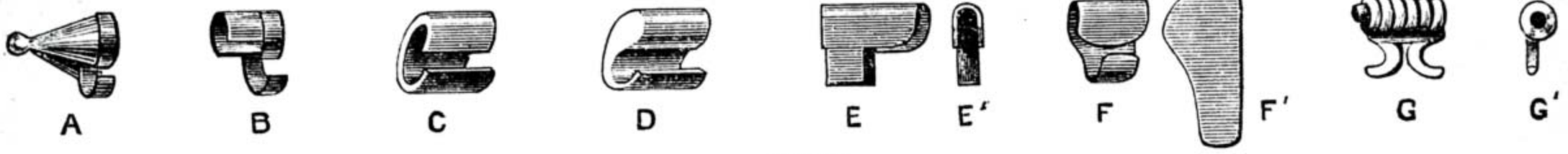

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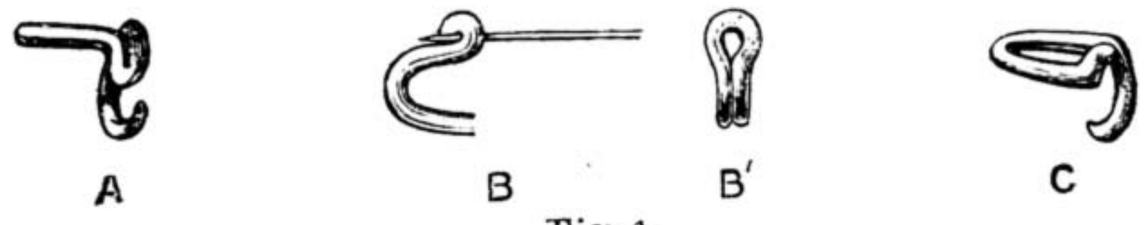

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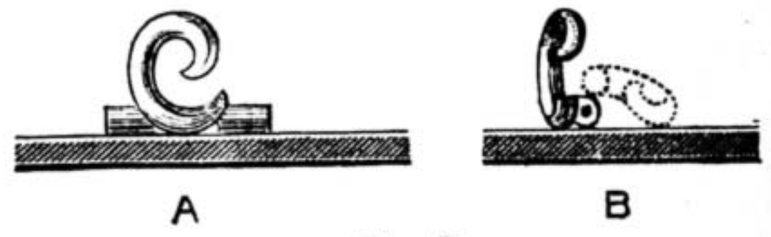

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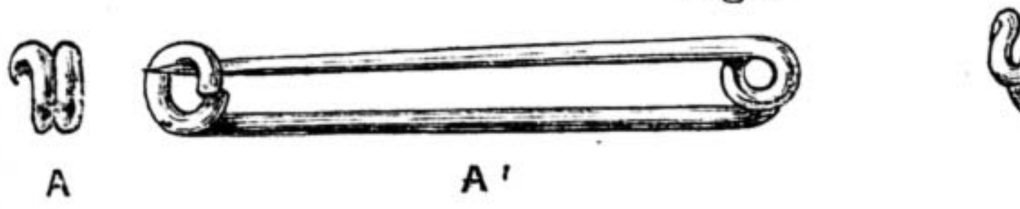

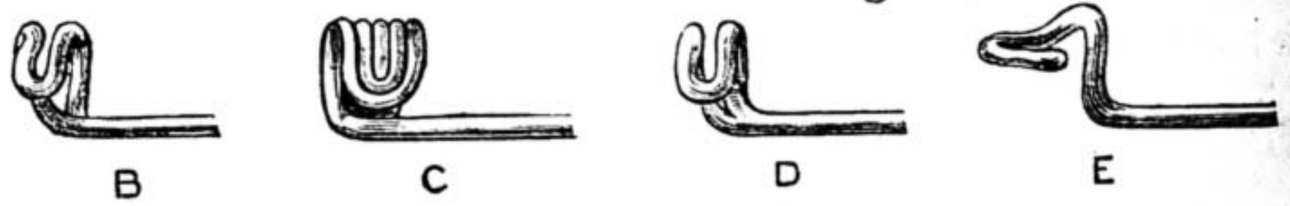

Fig. 5.

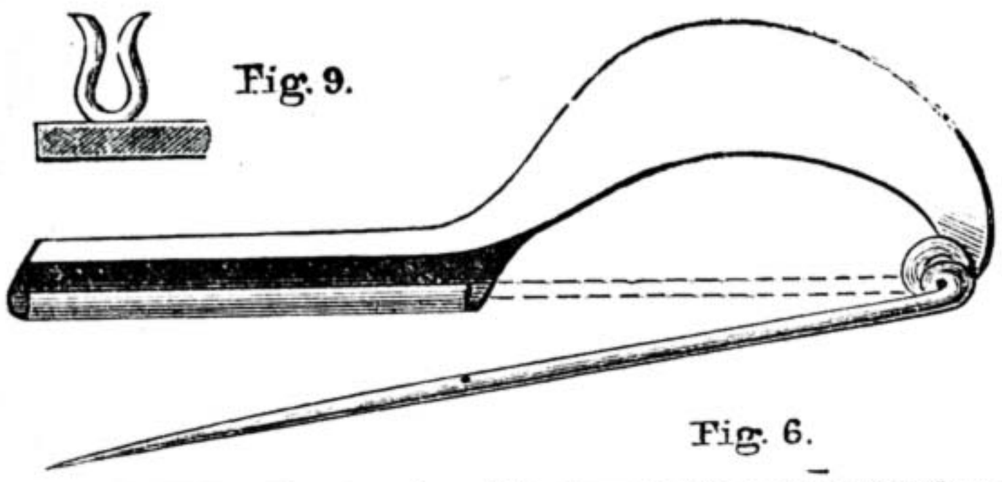
Fig. 6.

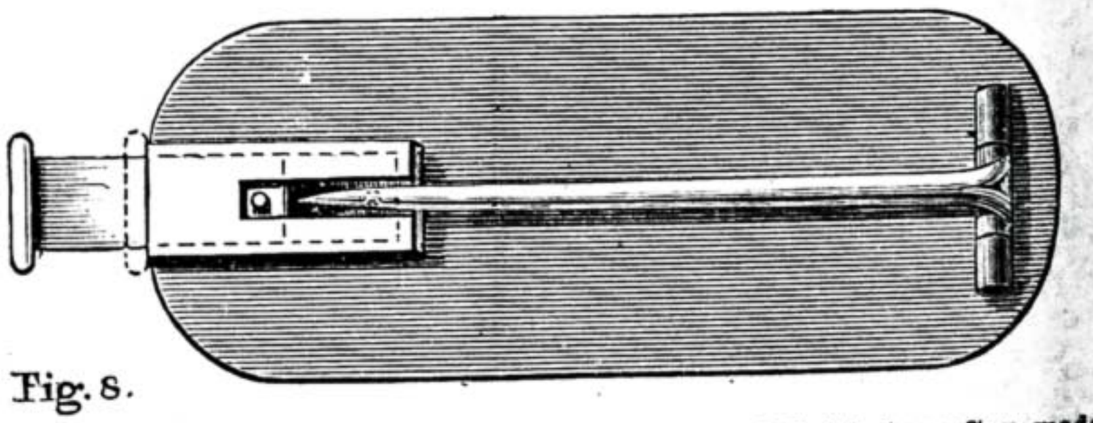
Fig. 8.

Fig. 9.

BROOCH CATCHES. Fig. 1.—A and B, Correct Shapes of Catches; C, Tongue in Section in several places; D, Bad Shape of Catch too often made. Fig. 2.—A and B, Forms of Catches with Spring to keep Tongue in place. Fig. 3.—A, B, C, D, E, F, Shapes of Safety Catches or Catches that protect Point of Tongue. Fig. 4.—A, B, C, Other Forms of Safety Catches made from Wire; B', End View of B. Fig. 5.—A, B, C, D, Forms of Catches used in Safety-Pin Brooches; E, Ugly and Bad Shape of same. Fig. 6.—Type of Ancient Etruscan Brooch, showing exceptional Length of Catch. Fig. 7.—Fall-Down or Hinged Catch—A, View from Outside of Brooch; B, End View, with Dotted Lines showing Position when folded down and not in use. Fig. 8.—Patent Catch shown, the Dotted Lines giving its Position when closed. Fig. 9.—Lyre Shape or Clip Catch.

A CARVED BUREAU.

BY D. ADAMSON.

CHIPPENDALE'S FRETS AND ORNAMENTS.

ALTHOUGH Chippendale furniture is often spoken a good deal of, confusion exists as to what it really is, so perhaps it will be well to devote a short space to a few remarks about it. First and foremost, Chippendale was a prominent cabinet

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maker who flourished about the middle of last century. His business lay among the aristocracy, hence, along with his appointment as Court cabinet maker, it may be assumed that he was able to command good prices, which is sufficient to account for the careful finish which characterises all his work. As, however, he only followed—or, perhaps, to a certain extent led—the then prevailing fashions, much, indeed most, of the furniture which is said to be "Chippendale" is, undoubtedly, not of his construction—*i.e.*, it did not emanate from his shop. It may be quite correct to say that a piece of furniture is Chippendale *style*, but quite the reverse to say that it is "genuine Chippendale." The latter can only be truly said of furniture made under his superintendence; the former may be said of all that bears the character of his designs, whether by himself or not. As he published various editions of a well-known book of furniture designs, it is not surprising that we find many of them reproduced by cabinet makers contemporary with him, but there were also others who issued books of designs about the same time, some of them anterior to his. These being the same in their leading features, it cannot be claimed that Chippendale originated the style which goes by his name, but it may fairly be conceded that he produced many new designs in what, as a business man, he knew would meet the taste of the times. That his work was good is not to be gainsaid, so good, indeed, that we are apt to lose sight of the fact that his style—or the style of the times in which he lived — was not altogether commendable. He hardly descended to the fantastic vagaries of some of his contemporaries, and there is a certain refinement about his lines which almost disarms criticism of the style. Let any one compare the designs in his book with those published by Johnson, another artist of the same period, and the restraint of Chippendale will at once be apparent, however florid his work may appear when contrasted with other styles. It should be said that Chippendale's later work is not so meritorious as his earlier productions, which are free from many of the extravagances found in these. It almost seems as if, after having, no doubt, personally prepared his earlier designs, he left this part of the work to others not possessed of the same skill. Be this as it may, few will be found to dispute the fact that his style deteriorated as it advanced, and that few, except his simplest—and best—are desirable as models for reproduction, especially by amateur craftsmen.

As these remarks may not be in accordance with the notions of those who—generally without much, not to say without any, knowledge of the subject—"swear by" Chippendale, let me point out the singular mixture of styles, "Gothic," Chinese, rococo, etc., which he combined often in the same article of furniture. At the very least, it cannot be said that this conglomeration is in accordance with present taste; so that to make a bureau which shall be "Chippendale," and at the same time such as could be regarded with pleasure, we must confine ourselves to a simple mode of treatment. We find this ready to hand in the fretwork of which Chippendale made such free use. Much of it was avowedly derived from Chinese sources, but in addition we find that other ideas were engrafted along with them, so that there is no reason for confining the frets to those which are distinctively Chinese. To ornament a bureau in the manner indicated the frets should be cut out of thin wood—veneers will do very well—and glued on to the fronts of the drawers, etc. It must be understood that the veneers should be saw cut, not knife cut, as these are altogether too thin. If the three lower drawers are made of the same size, the frets for them may be cut together, as, the material being thin, it will be almost as easy to saw through the three thicknesses as through one; in fact, the risk of breakage while sawing will be considerably reduced. If, however, only one thickness is to be sawn at a time it will be necessary to protect it by cutting along with it a thicker piece of wood. As this is merely required to prevent the veneer being broken by the saw catching, a piece of pine will do very well. The fretwork may either cover the whole of the drawer fronts, or be limited to strips glued on round the edges, if a simple decoration is all that is required. In the latter case the labour is considerably diminished, as all the strips being of the same width, as many as convenient may be cut at a time. To hold them together while being sawn they should be fastened by small wire nails driven through the waste wood. The pattern, of course, must be on the top veneer before nailing together, in order that the nails may be only in the waste wood, *i.e.*, in the pieces to be cut out. Needle points may be used instead of small nails, but they are open to the objection that there is a risk of the veneers springing apart. This is not the case if nails are used, as these can be driven right through, and the projecting points hammered over to form a kind of rivet. This method is far preferable to the one sometimes adopted by amateurs of fastening the wood together by dabs of glue here and there. This may be done, but there is the difficulty of getting the glue only between the waste and preventing any of it getting between the parts which form the finished fret. It will be found to promote easy working of the saw if a piece of greased paper is fastened in between the veneers, as the grease forms a continual lubricant as the saw proceeds. Tallow is about the best medium, as being tolerably hard it is not absorbed by the wood. The paper used should be soft and not too thin — an old newspaper answers very well. As the paper is cut at the same time as the wood, on separating the layers of this it will be found that the papers are identical, so that they may be used as patterns for any repetitions of the fret which may be required. This may frequently save the trouble of drawing a pattern a second time, and the outlines are clearer than those reproduced by heelball rubbings. Owing to the difficulty that may be experienced in gluing the greased paper, template, or pattern on to the wood, it will be advisable, when duplicates for this purpose are wanted, to let one of the pieces of paper between the frets be ungreased and fairly thick. After the frets are completed, it is only necessary to glue them to the drawer fronts; but some care will be required to do this neatly and prevent glue exuding beyond them. It will be almost impossible to avoid this entirely, but any which makes its appearance should be carefully scraped away while it is still soft, for if allowed to get hard the difficulty of removing it and the risk of injuring the wood will be much increased. The glue should be applied thinly and evenly. If of the ordinary kind it should be freshly made, but for work of this sort Le Page's carriage glue, now obtainable at most dealers in tools, possesses many advantages. The fret must be well pressed down to ensure perfect contact and adhesion to the wood under it, any tendency to rise being overcome by weights left on till the glue is set. Should it be found on removing the pressure after the glue has hardened that any parts have failed to adhere properly, they may be laid

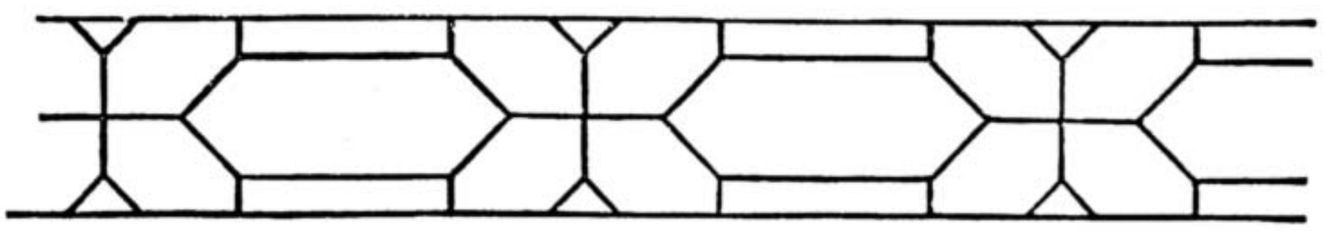

Fig. 8.

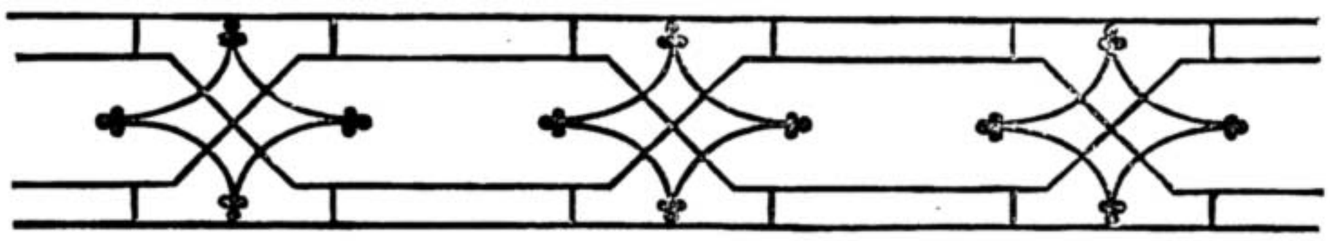

Fig. 9.

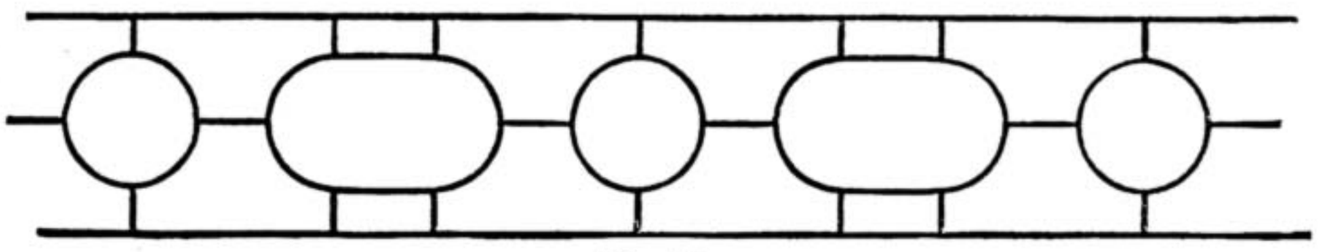

Fig. 10.

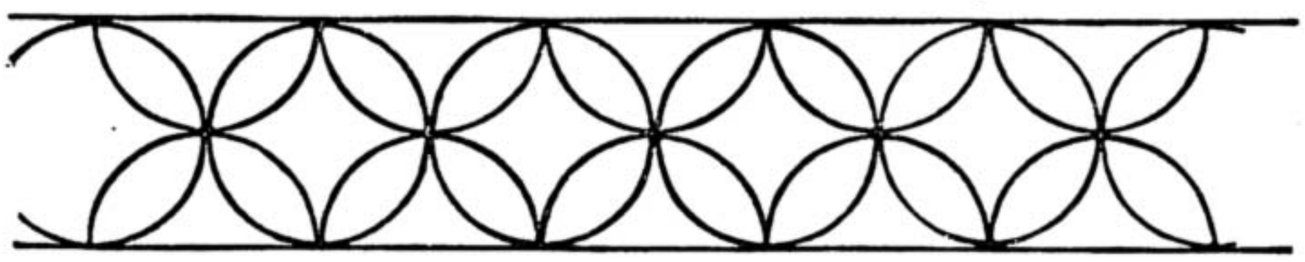

Fig. 11.

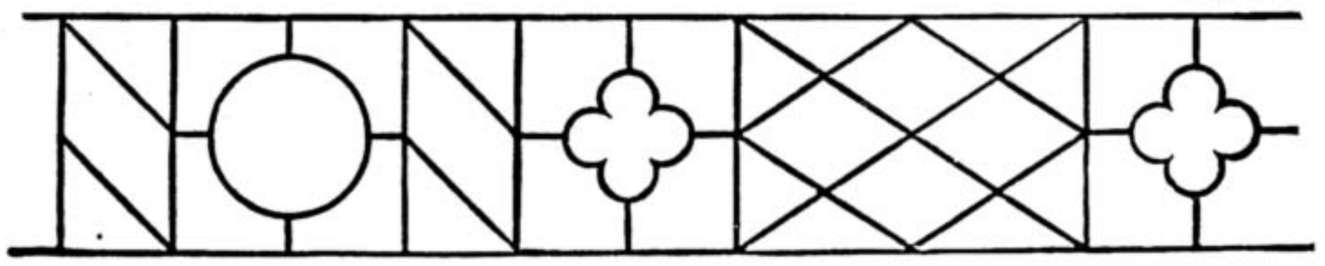

Fig. 12.

Figs. 8-12.—Examples of Chippendale Frets.

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by the application of a warmed flat iron. This should be previously made hot enough to melt but not to burn the glue. Any defects of this kind ought to be rectified before the polishing is done, as the heat would damage the polish. It should also be said that there must be sufficient moisture remaining in the glue to permit the heat to soften it; therefore, blisters should be laid as soon as possible.

Now a word about the polishing of such applied fret and the ground on which it is fixed. It will be found that this requires much care to prevent the polish spoiling instead of improving the effect, the difficulties consisting in the almost impossibility of getting uniform brightness on the sunk portions, and the liability of any excess of polish in the rubber to congeal in the open corners of the fret. The best way to overcome these difficulties is to let the ground be dull, merely finishing it by oiling, and then giving the subsequent polish with a firm hard rubber to the surface only of the fret. This will then appear bright on a dull ground. A still better method, though involving more labour, is to polish the veneers before fretting them—when, after they are laid, it will only be necessary to oil over the groundwork, and to touch up the surface of the frets. Any oil getting on while finishing the groundwork will not hurt the polish, though it will be necessary to wash off any "sweating" which may, and probably will, appear in course of time. If the fret is only applied as bordering, it is hardly necessary to say that the remainder of the work should be polished thoroughly, either dull or bright, and not merely oiled. To those who are at all conversant with Chippendale's style, mahogany will at once suggest itself as being the most appropriate wood, though there is no practical reason why the work should not be executed in any other; for example, much furniture ostensibly reproduced, wholly or in part, from his designs, has of late years been finished black or ebonised. With the faces of the frets polished bright, and the remainder either dull or dead, the effect is rich, and there is the further advantage that choice, finely-figured wood is not required. However, if the work is to be of mahogany finished in its own colour, this should be darkened if the deep tint of old mahogany is wanted. It may be effected either by fuming with ammonia or washing a liquid stain in, but as the former does not raise the grain it is to be preferred.

The accompanying illustrations (Figs. 8 to 12) of frets are all suitable for Chippendale furniture, and as they are purposely selected for the facility with which they can be drawn enlarged to suit the work, it is to be hoped even those unskilled in drawing will be able to make use of them, for being of a geometrical construction they can easily be set out by means of ruler and compasses. It must be understood that these frets by no means exhaust the Chippendale style, but they are such as any amateur can easily cut, and they are, therefore, more suitable than those of more complicated arrangement. They may easily be cut in sections and neatly joined together when laying them, but it may be useful to know that any length can be cut with the ordinary fret-saw frame if this has adjustable clamps, so that the saw can be adjusted to work in different directions. The same may be managed, irrespective of the length under the arm, with many of the fret machines which have a perpendicular action, as, for example, the newer machines of the Britannia Company. The Chippendale style, which, as here exemplified, is given in its least objectionable features, seems soon to have outrun its popularity, and before closing the remarks anent it, an extract from a writer may be quoted, showing that even when it was all the rage it did not meet with universal approval by those who were unbiassed by fashion. Thus wrote an architect contemporary with Chippendale, mentioning his style:—"An unmeaning scrawl of C's inverted and hooped together. . . . . It is called the French, and let them have all the praise of it. The Gothic shafts and Chinese bells are not beyond it nor below it in poorness of imagination." It will, of course, be understood that as we are not giving a full analysis of Chippendale, the features so strongly condemned are not included in the directions how to make a Chippendale bureau.

After the vagaries of the Chippendale style had exhausted themselves, it is not surprising that a strong reaction set in against the absurdly devised ornamentation which he affected, and it is with almost a feeling of relief that one turns to the simpler designs of Heppelwhite, the next in order of the trio of cabinet makers whose names are landmarks in the history of English furniture. As in the formation of the Chippendale style we may easily discover the influence of an architect (Chambers), so in the Heppelwhite may we trace the inspiration to the classical feeling which pervaded the works of later architects, among whom the brothers R. & J. Adam stand prominently forward. There is a refinement about Heppelwhite's lines, with a simplicity for which we look in vain among the productions of those cabinet makers immediately preceding him, but as applied to our bureau there is little that is sufficiently distinctive to warrant any lengthened description, without, indeed, so far complicating the work that it would be practically useless for the amateur artisan to attempt it. It may, however, be said that mahogany still remained the characteristic wood for good domestic furniture, and that the ornamental details of carving and inlay show a strong classical tendency, with great neatness of execution. The keynote of Heppelwhite's style may perhaps best be explained by an extract from his book, which we may well imagine was written just one hundred years ago, as it was published in 1789. His words run thus: "To unite elegance with utility, and blend the useful with the agreeable." As Heppelwhite worked in the style of the Bros. Adam, who, in addition to their purely architectural work, have left us some specimens of their smaller work in the shape of furniture, it is not incorrect to regard them as being identical. True, there are distinguishing features between the two, but it would be almost beside our purpose to consider them, and, as in the case of Chippendale, though for different reasons, an exemplification of Heppelwhite's style in an easy form is all that is required. As already stated, it does not in the case of plain carcase work offer any very marked characteristic, a certain severe simplicity being all that is required. In fact, if we make the bureau as originally described, but in fine dark mahogany with a little inlaid stringing, taking, let us say, the form of the Grecian key pattern, it may be said that the style is "Heppelwhite."

With this we may take leave of this great cabinet maker, whose works, though not perhaps like Chippendale's, "familiar in our mouths like household words," are yet deserving of consideration as marking very emphatically the return to a purer style. We may deny ourselves the further examination of Heppelwhite's style with less regret when we remember that the last and, perhaps, the greatest cabinet maker, as an artist of the eighteenth century, designed on much the same principles, developing the style of Heppelwhite (or Adams) with a grace and purity of line peculiarly his own. The maker referred to—Sheraton—published his first book of designs in 1793-4, and though ostensibly an educational work on drawing for cabinet makers, it contains representations of furniture in his best styles, for in his later works, published in 1803 and 1804, we find that there is an extraordinary deterioration, a fact of which Sheraton seems himself to have been conscious. Those who wish to reproduce his work will therefore do well to note this, as all is not gold that glitters, neither is all good that's Sheraton's. We find that he made free use of choice veneers and inlays. Many, I am aware, object to veneering, but when conscientiously employed there can surely be sound reason for regarding it as a legitimate means of decoration. Sheraton certainly did not think its use incompatible with either beauty of design or sound work, but exception must be taken to some of his arrangements, and the modern designer will do well to avoid copying them. I refer particularly to grain of the veneer running across instead of along the piece on which it is stuck. For example: in a drawer front the grain should run from end to end, horizontally, not from top to bottom, perpendicularly. Much more is this the natural way of arranging veneers on the frames of doors, yet it is often seen—happily not now so much as formerly—just reversed. Now, though Sheraton erred in this respect, it must not be supposed that he was the only one who adopted this construction; but, whenever found, it can only be regarded as faulty, unless, indeed, in the case of stringings or bandings introduced for purely decorative purposes, and should not be copied. If we wish to see how Sheraton's style may be adapted to modern requirements in the light of increased attention and knowledge to the principles of design, we cannot do better than study the modern inlaid furniture which is to be seen in every good cabinet maker's. This, popularly but erroneously regarded as Chippendale, is, in fact, the modern rendering of the principles which guided Sheraton, without, it is to be hoped, his faulty work, such as has been alluded to above. We find that Sheraton's furniture depends for its effectiveness not so much on carving, at least, where flat surfaces are concerned, as on coloured inlays, bandings of various woods, such as tulip wood, and contrasts between different kinds of woods. Rosewood and satinwood seem to have been a fashionable combination, the surface of the latter being often ornamented by decorative paintings of a delicate character, in the form of festoons, wreaths, garlands, ribbons, etc. Inlaid panels of a very similar character to those so often seen nowadays in rosewood furniture were also largely employed, so that the artificer who desires to work in Sheraton style will find plenty of scope for his talents and mechanical skill.

SMITHS' WORK.

BY J. H.

ARMOUR.

THERE was plenty of work for the armourer smiths in the Middle Ages. It would be

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interesting to trace the development of the arms and armour of that long period. Though few authentic specimens of ancient armour remain, we have history in tapestry, stone, and brass, by which we are able to rehabilitate the old knights. There was, first, the mailed shirt or hauberk, a woven fabric covered with chain mail, consisting of numerous rings in close contiguity. By-and-by the custom arose of covering the more vulnerable parts of the body more effectually with plates of iron, and this finally developed into the massive panoply of armour of the ages of chivalry—armour so weighty that a knight unhorsed was helpless and at the mercy of the meanest foot-soldier. The helm also protected the head itself against the battle-axe and mace, but afforded little or no security against the stunning effect of the blows dealt by those weapons.

The hauberk, or coat of mail, underwent various modifications. At one time it had a coif or hood, which might be drawn over the head, and over this the helm was worn. Below it was lengthened, and divided to cover the lower limbs. The sleeves were lengthened to cover the wrists. Gauntlets or gloves of leather, and leggings (*chausses*) and coverings for the feet, also covered with mail formed of small plates or rings, came into use. Then, when these were found insufficient for protection, arose the practice of protecting the more vulnerable portions of the body with plates of iron fixed by straps and buckles over the mail. These were at first fitted to the elbows, knees, and shoulders, and afterwards to the arms, thighs, and legs, first on the outer parts only, but afterwards clasped completely round the limbs.

The advantages and disadvantages of light and heavy armour were apparent in the Crusades. In the first Crusade the heavily-armed knights of the West coming into collision with the light-armed Saracen cavalry clothed only in chain or ring mail, bore down all before their solid phalanx. But, afterwards, the Saracens gained the advantages due to their lighter equipment under a Syrian sun. Lightly clad, they swept round the comparatively inert masses of their opponents, and attacked them on all flanks, watching their opportunities to beat down the long serried lances, and so bring their light swords into play. And thus they more than made up, by their swiftness and bravery, for the advantages gained by the heavy panoply of armour worn by the knights of the West.

By the close of the fifteenth century armour had about reached its highest stage of completeness, as far as multiplication of parts is concerned; though, in the matter of elaboration and ornament, a great deal yet remained to be done. At the close of this century a knightly suit of armour covered the whole body *cap-à-pie*—breast, back, shoulders, arms, legs, feet and hands, head and neck; and each separate piece had its distinctive name.

With the invention of guns and cannon the disuse of armour commenced. But, in the period of its decadence, there prevailed the utmost elaboration of detail and beauty of art workmanship. As its value in actual combat declined, so the richness of its ornamentation increased, and the work of the smith merged into that of the jeweller. To this period belong most of the suits of armour still in existence, and they are well worthy of careful study as specimens of handicraft of the highest kind.

Then the armour gradually fell into disuse before the spread of firearms. First the protection of the lower limbs was abandoned, the cuirass remaining to protect the vital parts of the body. Even this was presently felt to be a useless and intolerable burden, so that it was only with the utmost difficulty that kings and princes could enforce its use.

The armourers of Milan supplied the nobles of Europe with the choicest productions of their art. Suits of plate armour of steel were covered all over with elegant arabesques beaten up and then chased. Sometimes damascene work in gold and silver was added to the beaten arabesque work. Sometimes, again, the work was fluted, and polished like a mirror.

A study of the examples in the Tower, and in numerous other collections at home and abroad, will inspire us with regard for those who, with rude tools, could execute such intricate and difficult tasks as are involved in the formation of armour.

Our surviving specimens of armour are not so old as was formerly supposed. It is doubtful if any authentic specimens of the Norman period remain unaltered. Very little of the Plantagenet period remains. Nearly, if not quite, all of the armour in existence dates from a period subsequent to the introduction of firearms, when armour had become less valued for purposes of defence than for ornament, when it was used for jousting or military show rather than for actual warfare. The armour, therefore, which we can actually study affords, though of comparatively recent date, excellent examples of periods in which the art had reached its highest stages of development, in which perfection of workmanship was combined with the highest ornamentation.

In our great national collection of armour in the Tower, the development of the later period can be profitably studied. Beginning at the left hand as we enter the armoury room in the White Tower, we have the earlier specimens, consisting of mixed chain and plate armours. The making of this chain armour must have been a very tedious process, particularly when we remember that the wire itself had to be beaten out by hand. The rings are, in most instances, welded together. Some are of round wire, and others of flat section, with the appearance of having been stamped out of sheet iron. The dimensions of the rings of which the armour is composed vary considerably. For the most part they average from $\frac{3}{8}$ in. to $\frac{1}{2}$ in. diameter. In exceptional cases they are as large as $\frac{5}{8}$ in., or as small as $\frac{1}{4}$ in. They are, in some cases, lapped and thinned out, and apparently welded; others appear as though lapped and riveted, each with a minute rivet. In some examples rings punched from flat iron, and rings made of round wire with abutting joints, alternate in rows. Gradually the use of plate armour began to supplement the chain mail, and this transition period is well illustrated. At last we have the warriors armed *cap-à-pie* with plate.

The earlier plate armour was plain, that of later date is variously ornamented. At the first the pieces were ribbed or fluted with a succession of contiguous flutes, the effect being very pretty. Then engraving and damascening were resorted to, and finally attained a very high pitch of perfection. A suit of armour belonging to Henry VIII. in the Tower, presented to that monarch by Maximilian, is foliated and engraved all over with human figures illustrative of passages in the lives and martyrdom of St. George and St. Barbara, with the badges of roses and pomegranates, and the letters "H" and "K," for Henry and Katharine of Arragon. This suit was formerly covered with silver. The horse is also in complete armour. There is another suit of Henry VIII. beautifully damascened—that is, wire of brass, gold, or other material, is beaten into narrow grooves punched in the plate, and so worked all over into patterns more or less elaborate. The appearance of these suits of armour in joust and tournament must have been truly magnificent. But the minute details of workmanship are no less noteworthy.

Some of these suits of armour were very heavy. There is one of Henry VIII. weighing ninety-two pounds; another of Charles Brandon, Duke of Suffolk, bearing date 1520, of one hundred pounds weight. And these are built up of thin plates and minute rivets. The plates are bent to the difficult forms required to permit of the free play of the joints and various parts of the body, and then, besides, they are frequently fluted and covered with inworked or inlaid ornament. There is never a bruise to be seen—never any flat, or angular, or waved portions; but the curves are as perfect as though stamped between dies. Probably the hammering of the broad surfaces was done with wooden mallets, the work being laid on a bed of pitch or similar yielding substance.

The accoutrements are as elaborately finished as the armour itself. Spurs and bits are engraved similarly to the armour. Helmets, gorgets, casques, and morions are artistically finished. Pikes, maces, and roundels are also excellently made, and covered with engravings.

SIGN-WRITING AND LETTERING.

BY HENRY L. BENWELL.

EXPANDED LETTERS—ELONGATED, CONDENSED, AND COMPRESSED LETTERS—HAIR-LINE ITALIC—HOW TO SET OUT, LETTER, AND FINISH A SIGN—SPACING, ETC.—PAINTING ROYAL ARMS, ETC.

HAVING digested as thoroughly as space will permit the subjects of ornamental and church lettering and other matter appertaining thereto, I have now only to draw attention to one or two other much-used forms of letters before finally quitting the subject.

I refer here principally to letters that have to be somewhat distorted in shape to suit the exigences of space, which in some cases is too much, and in others too little. Let us first take the case of having to write a rather short name over a shop-front or on a long narrow board or surface. In this example the ordinary-shaped letter could not be made to fit or look well, and we therefore have to expand it, so that it may not only fill out the long space better, but also be sufficiently decreased in height to come within the compass of the width of the board and allow for shading, etc.

We do not in reality decrease the height of the letter, but use a letter small enough for the purpose, and widen this to such an extent as not to look positively ugly, and which would be the proper width of a much higher letter in its normal form. When, therefore, it is desired to fill out an extra long line with expanded letters, the expansion must be proportionate throughout, so that the work may have a symmetrical appearance.

This expansion can be executed with mathematical precision according to the following method:—

We will suppose that we have to put some

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letters on a signboard 6 ft. long by 1 ft. 6 in. wide, but that the ordinary letter, properly spaced, would only extend to 3 ft. 3 in., and that we therefore require to expand the letters so as to make them up to 5 ft. We must now refer to the diagram which is given in Fig. 81, and drawn to a scale of one inch to the foot, roughly. The length of the normal letters, 3 ft. 3 in., is from A to B, and we have to spread them out 1 ft. 9 in. without increasing the height. We first rule two parallel lines at any convenient distance below, and 1 ft. apart and 6 ft. long, *i.e.*, from C to D. We now draw a diagonal line, A to D. Then draw slanting lines parallel with each other from the bottoms of the top row of letters to the diagonal line, and from there vertical lines to the line C D. If we now proceed to draw in the bottom letters according to these lines, the result will be as shown in the diagram. Letters can be extended as much as possible by this method by simply increasing the slant of the diagonal line, and they may also be condensed by drawing the diagonal line within a shorter compass—as, for example, from A to E. To use this problem in actual practice, the student may either work it out, as I have done here, in a scale drawing, or draw the letters full size on two lengths of lining paper tacked to a wall or floor, and the outline of the extended letters prepared for pouncing the design upon the signboard. An alphabet of expanded letters will be seen in Fig. 75, and some Expanded Ionic in Fig. 80.

Elongated letters are just the reverse to the former series, and are principally used in circumstances where the surface to be lettered is very short in length, but of an unusual height. I do not know that I can give any practical advice concerning them, but a reference to Fig. 79 will illustrate form and probable usefulness.

There are also condensed letters, such as the letters H, E, R (Fig. 78), and compressed letters, as T (Fig. 82), which all come in useful on certain occasions. Other useful alphabets are the italic and hair-line italic, a full complement of the last-named being shown in Figs. 76, 77.

Having now finished my remarks respecting the various styles of letters and the method of forming them with truth and graceful outline, I will now describe how to put them to practical use in "setting out" and lettering a sign. Taking it for granted, therefore, that the signboard is quite ready to work upon, we make a start by damping the whole surface with a wet chamois leather. This simple process must always be gone through, otherwise the colours will "ciss," and no end of trouble will be the result. This "cissing," as it is called, refers to the colours running off the ground colour and leaving a ragged edge instead of a sharp clear outline. This can only be rectified by the workman going over the same outline repeatedly, with the natural result of deteriorating the quality of the work when complete. Even this, however, will not always cure the evil. If the student finds his colours "ciss" after damping his board, he should give it another rub over with the leather, and should that fail to improve matters he must conclude that he has too much oil in his colour, and may be it is also too thick. He should, therefore, thin it with a little turpentine. I have always found that the addition of a little turpentine will at once prevent the colour from "cissing," and it, of course, makes the colour flow easier from the brush.

The size and character of the letters being determined upon, we strike the necessary lines to contain them, and proceed to set out the writing with the prepared pipeclay mentioned in a previous chapter.

Much depends upon this setting out and spacing of the letters, as it may mar or make the success of the young workman's effort; for no matter how well shaped the letters may be, if they are badly set out the whole work will look clumsy and inartistic.

In the first place, we must mark the whole of the letters out in a very light and sketchy manner, taking pains to make them fill up the board as evenly as possible. If when finished they do not "come in" properly, we must wipe out the chalk marks with the damp leather and try again. Great care must be taken not to press the pipeclay upon the ground surface, otherwise it will leave unremovable markings. With practice the young writer will soon be able to set out his letters with the utmost exactitude. But there is another matter to be considered, and that is the spacing of the letters themselves, one from another, as it were. In printed matter the letters are all spaced the same distance apart; not so, however, in sign-writing. The letters A, J, K, O, Q, P, V, and W, Y, if not some others, require to be placed closer to their neighbours on either side than the rest of the letters, for the simple reason that they are not of the same width throughout, and therefore leave a much greater space between letter and letter. A reference to any large printed matter, or to the alphabets given with these chapters, which are, no doubt, evenly spaced by the compositors, will prove the force of these remarks, and point out to the novice how to avoid the appearance of uneven spacing, which, strange to say, truthfully-spaced letters always give. The name, or whatever the matter may be, must be exactly in the centre of the board, with an equal space or margin at each end.

Nothing displays the want of skill in a workman quicker than the careless arrangement of a name in large letters, and which leaves a wider margin at one end of the board than the other, yet it is frequently seen, through indifferent spacing.

We will, however, take it that at last the letters are properly spaced and marked out, so we must next turn to our colours and pencil, and prepare for outlining them in colour. Having got the pencil into working order by dipping it in a little "turps" and wiping out any excess with a piece of rag, we spread sufficient colour upon the palette with the palette knife, and thin it out to a proper working consistency. I cannot give any exact guide as to the best working consistency of any colour. It should, however, be somewhat thicker than good rich cream. If too thick, it will not flow freely from the brush, and will probably "ciss;" if too thin, it will not only not cover sufficiently, but will very likely run and spoil the work. It must be absolutely perfection; a little variation either way will put everything out of order, and the workman out of temper.

The letters should be outlined boldly with a pencil well charged with colour, and which should not leave the surface till the outline is complete from top to bottom.

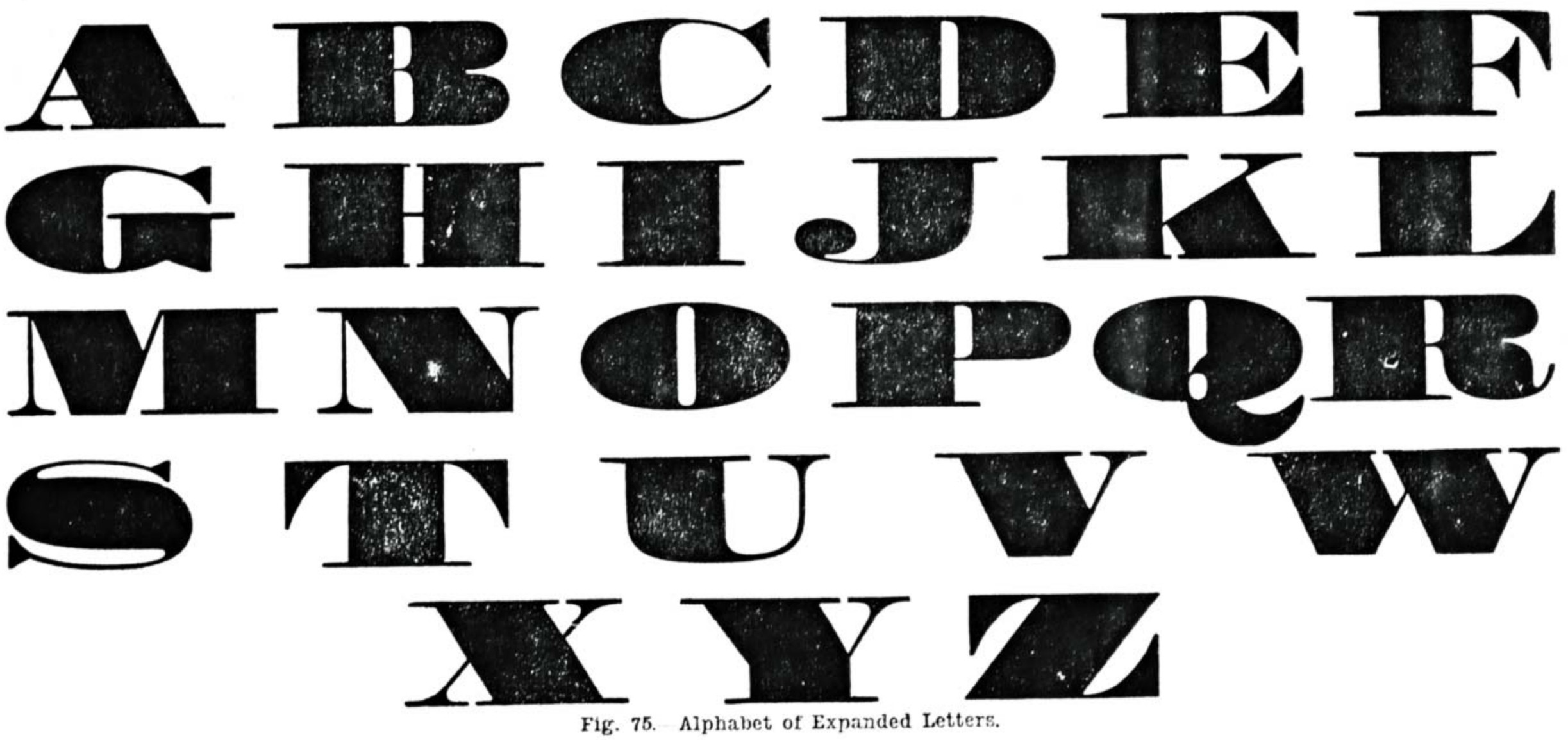

Fig. 75. Alphabet of Expanded Letters.

Fig. 76.—Hair-Line Italics: Capital Letters.

Fig. 77.—Hair-Line Italics: Small Letters.

Most amateurs and beginners make their outlines in a series of short strokes, and frequently stop in the middle of a line to recharge the pencil with colour, which renders the letters of a shaky aspect, and betrays the nervous, unpractised hand. Of course, in very large letters, the pencil will not hold sufficient colour to enable the operator to work from top to bottom without a break; but, as such letters are generally at a good height, distance softens off any imperfect or ragged outlines. If the student takes care to refill his brush with colour before starting on every fresh line he will generally find it hold out to the end. He must remember that the larger the letter, the larger the brush and its holding capacities, and so there need be no excuse for short, uneven strokes in any moderately-sized work. It is, I admit, more difficult at first to make a line in one continuous stroke than in two or three, but if the beginner once gives way to the latter method, faulty and unworkmanlike as it is, he will have great difficulty in shaking himself free from it in after life. The hand must not rest on the sign; if it be an unsteady one, the wrist may rest on the mahl stick, or upon the wrist of the left hand; but never touch the sign, or it will be cramped and hindered in its free movement. In curved letters this is especially so, as nothing is so necessary for their correct formation as a bold, free, and pliable hand. For the sake of practice, the student should make all his outlines of the same thickness throughout, as he will find this somewhat hard to accomplish at the onset. When the outlining is complete, the letters are filled in with a short thick brush (Figs. 44 and 44a, page 357), and then leave all to dry. On the succeeding day, the thicknesses (if any) are added and the shadows "put in," and, after undergoing any little extra touching up, we may consider our job finished and ready for varnishing. If the work is surrounded with a plain or fancy border, corners, and other ornaments, they are naturally proceeded with along with the letters, and the whole completed together.

One last word as a caution: Always use the point of the pencil in outlining, and you will get a straight even line; but, use it on its side, and it bulges or shrinks in with the varying pressure of the hand, and a waved, or "in and out," line is the natural consequence.

In italic and script lettering, the greatest care must be taken to keep the letters all of the same slope or slant, and, for this purpose, the workman had better make himself a few set squares, which may be used as guides. The slant in italic letters should not be so great as that used in ordinary script or writing characters, hence at least two set squares would be necessary. In script writing the capitals should be just double the height of the ordinary or lower-case letters. It seems now to be fashionable to use script writing for indicating millliners' and such-like businesses, for which it seems very appropriate, especially gold letters on a black ground. It should always be the endeavour of the sign-writer to make the style of his letters appropriate to the trade they indicate as far as he finds it practicable to do so. Some businesses allow of much more showy colouring than others, as I have already pointed out in a previous chapter.

In varnishing the completed work, it is best to give it three thin coats, well worked, than two thick ones, allowing each to dry thoroughly hard before applying the next. By doing this, the workman may do much to prevent the sun from cracking the varnish and blistering the paint.

Messrs. Wilkinson, Heywood & Clark make a splendid varnish specially for the use of sign-writers, and the name of this firm is, I think, a sufficient guarantee of good quality combined with a moderate price.

I will now describe the method of painting a few of those common objects, or ornaments as some prefer to call them, which the writer is so often called upon to execute as a part of a tradesman's sign or of an inscription on a trade cart. We also frequently

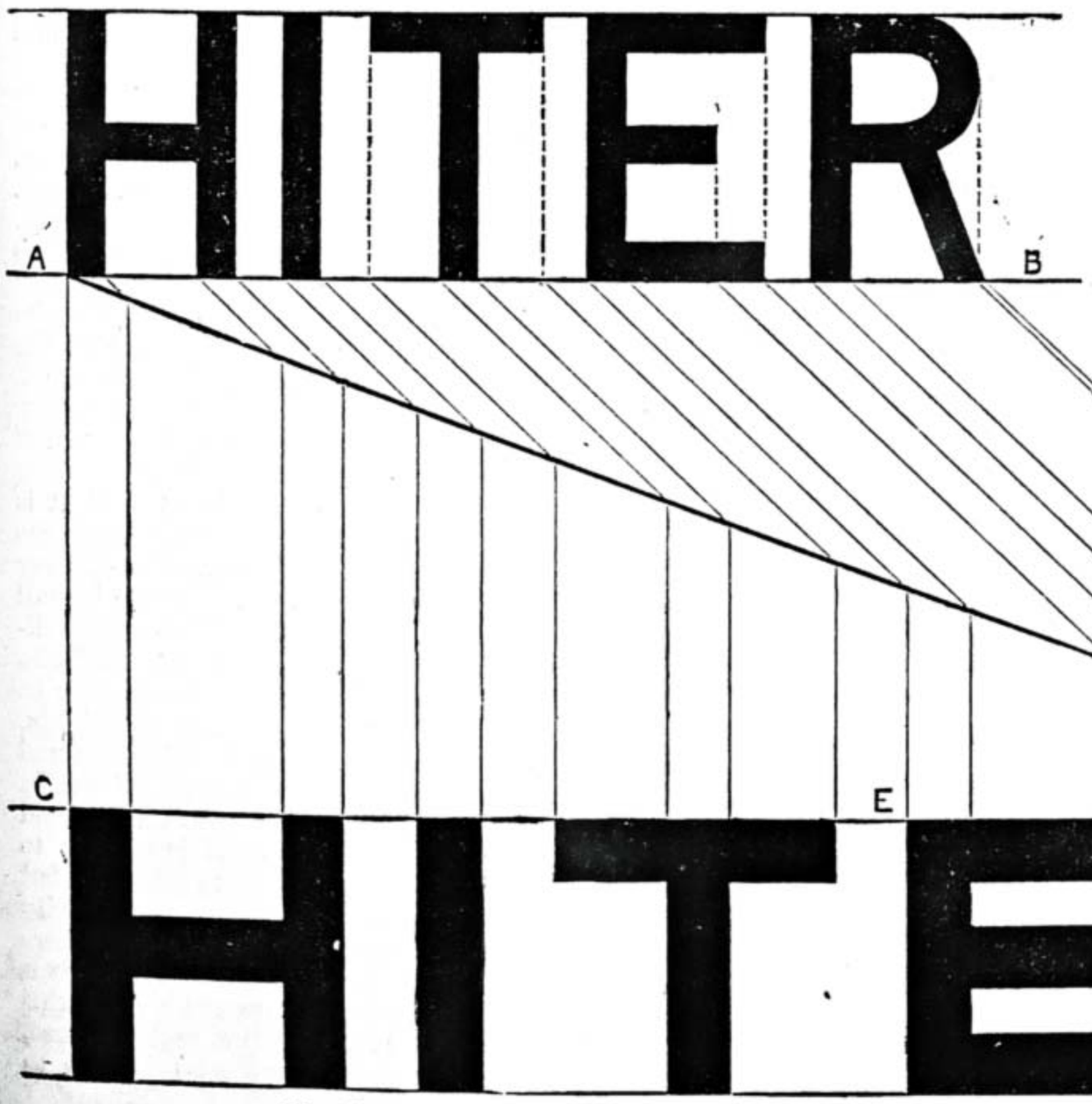

Fig. 81.—Diagram exhibiting Method of Expanding Letters correctly.

Fig. 78.—Examples of Condensed Letters.

Fig. 79.—Examples of Elongated Letters.

Fig. 80.—Examples of Expanded Ionic Letters.

Fig. 82.—Example of Compressed Letter.

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see the best work surrounded with a plain or an ornamental border which cannot very well be dispensed with, even if the writer is accustomed only to the simplest of work. Starting, then, with Royalty and the Royal tradesman—happy and favoured beings—I will first take in hand Her Majesty's Coat of Arms, which, I need hardly say, is always executed in gold and certain regulation heraldic colours. Now, I am honest enough to say that I know very little about heraldry, and also that I have never painted the Royal Arms in my life, for the simple reason that I have never had occasion to do so; nevertheless, if I had, I am one of those sort of fellows who "would be bound to do it." I am, however, going to rely on the undisputed authority of Mr. Wm. Sutherland in regard to the Royal Arms, and in doing this I know my readers and I are in safe hands.

The Royal Arms of England, with which are combined those of Scotland and Ireland, consist of a shield surrounded by the ribbon of the Most Noble Order of the Garter. The shield is surmounted by a royal crown, upon which is a lion, also crowned. The shield is divided into four equal parts—the first and third quarters are blazoned with the arms of England proper, viz. : three golden lions on a red or vermilion ground. The second (Scottish) quarter of the shield is a red lion rampant, that is, standing on its hind legs, pawing the air with its fore legs, surrounded by a tressure, that is two lines a little way apart, having small *fleur de lis* at each corner, and on the sides. This tressure is red also, the ground being gold. The fourth quarter of the shield is occupied by a gold harp on a blue ground, being the Irish national emblem. Round the shield is placed a blue ribbon with gold edges, upon which is displayed the motto of the Order of the Garter, *Honi soit qui mal y pense.* Each side of the shield is supported by a lion and a unicorn; the lion to the left, as we look at the shield, and the unicorn to the right. The unicorn has a gilt horn springing from out of his forehead; round his neck is a collar of gold, to which a gold chain is fastened, overlapping his body, and secured below. The lion is painted proper, that is in natural colours; the unicorn is white with gold hoofs, and the tip or tuft of hair at the end of his tail is also gilt. Underneath the shield are scroll ornaments upon which the feet or claws of the animals rest, and upon which also a ribbon is hung. Upon the ribbon is the motto, *Dieu et mon droit.* This ribbon is blue, but generally of a lighter colour than the blue of the garter round the shield. The letters on both should be in gold, outlined with black. Underneath the shield and springing from the scroll ornament are conventional representations of the rose, the thistle, and the shamrock, national emblems of the three kingdoms. In painting this, or in fact any heraldic emblem, every part of the work is outlined with black, and shaded more or less. The gold is best shaded with burnt sienna, with a little burnt umber added; and the white parts, with Vandyke brown and ultramarine blue, or with blue black alone; the reds and blues with purple lake, or burnt umber and crimson lake. It must be understood that the colours of coats of arms are fixed, and therefore there can be no departure from them or we create false heraldry.

I will now describe the arms of the Prince and Princess of Wales. As Prince of Wales His Royal Highness bears the shield of his mother (as Queen of England), differenced with a silver label of three points, as the Princes of Wales, his predecessors from the time of the Black Prince (who was the first English Prince of Wales by creation), have borne the Royal Arms with the same difference. Accordingly the arms of the Prince of Wales are quarterly, first and fourth England; second, Scotland; and third, Ireland; the label being in chief (*i.e.*, on top part of shield), and extending across the entire width of the shield. Upon this shield that of Saxony is now charged in pretence. The arms of Saxony are *barry of ten, or, and sable, a crown of rue in bend, vert.*

His Royal Highness also bears the feather badge, the well-known cognisance of the Prince of Wales. The three ostrich feathers of the famous badge were first ensigned with a princely coronet by Edward Tudor, Prince of Wales, son of Henry VIII.; and Henry Stuart, eldest son of James I., established the arrangement of the feathers within the coronet as they have since been blazoned. A single ostrich feather having a scroll with the motto *Ich dien* (I serve), may probably have been borne, after an early usage, by the Princes of Wales.

A coloured sheet of the Royal Arms of England appears in Part CVIII. of "The Journal of Decorative Art" for December, 1889. It should prove very valuable to the sign-writer, who so frequently has to paint it on signs and trade vans.

MEANS, MODES, AND METHODS.

A Lost Colour Material Discovered. The brilliant blue of the Egyptians and Greeks in use more than twenty centuries ago was regarded as lost to modern science and industries, as it had been out of use for many centuries. The traces of it were manifest in the ever-brilliant colours in the Pyramids, Greek tombs, Pompeii and Roman tombs, and in the frescoes from walls preserved in the Vatican.

It was sometimes called the "Egyptian Blue," and by the Romans—who never scrupled at appropriation—the "Vestorian Blue." Several chemists of note tried by analysis to ascertain its constituents—Sir Humphry Davy, amongst others—but without result.

Vitruvius, a Roman writer of about the calibre for science of our daily journalist writers, gives a description of its composition of about their stamp of writing, and worthless to workmen or scientists. In the many attempts to reproduce this colour, the experimentalists showed sad lack of comprehension by using alkalies, acids, and compounds not at all likely to have been in the laboratory of ancient pigment-makers. Had they gone to Egypt to do as the Egyptians of old had to do, they would not have found these materials within handy reach. A French chemist, M. Fouqué, took a common-sense view of the matter, and for his colour used oxide of copper; for his bases, lime and silica; and the pigment material only needed a bright red heat and patient mixing, and the long-lost blue of the ancients was revived, and will form a new commercial article of surprising cheapness, and no money wasted in patenting it.

The proportions of the ingredients are:—

Silica	63·7
Lime	14·3
Oxide of copper	21·9

The variation of the quantity of copper, of course, affecting the intensity of the colour, or its tint and shade, may be modified by oxides of other metals.

As a dye-stuff, it is as good as it is as a pigment. J. C. K.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

125.—A New and Good Self-Clipping Buckle. I have received from Central India a specimen, with drawings, of a new—as far as I know, remembering that there is nothing new under the sun—and good—which I think nobody who sees it will deny—self-clipping buckle, with which, I must confess, I am very much taken. The sender of the article in question writes:—"I am taking the liberty of sending you a patented invention of mine in the shape of a 'self-clipping' buckle, if you would be good enough to notice it in 'Our Guide to Good Things.' I am desirous of selling the thing, and would be glad if you would mention this in your notice. You state in Work that you are willing to bring forward anything new like this, so I hope that a request such as I am making will not be thought impertinent, especially when it is considered how greatly handicapped one is in being so far from England in trying to dispose of such a thing, it being so difficult to find out from this outlandish place who exactly are the people who would invest in an article like this, besides a great amount of time being lost in carrying on correspondence. From the specimen I send you by this mail and the enclosed drawing, you will see that pulling the strap tight makes the buckle grip it, and, theoretically, the harder the pull the greater the grip. No holes are required in the strap, and a special feature is that the thinning of the strap through wear can be compensated, for which purpose the upper clipping limb is made curved. When the strap wears this limb has merely to be flattened, thus bringing the two gripping bars closer together. To loosen the buckle and free the strap the central bar has merely to be lifted with one hand, instead of having to employ both, as in the ordinary buckle. It could be made as cheaply as an ordinary buckle, and if desired wholly of wire it could be made as shown in Fig. 2 of the drawing. The buckle is well adapted for bedding straps, Gladstone-bag straps, tourniquets, leggings, ladies' and gentlemen's belts, etc."

I have now done what I have been asked to do by my correspondent, whose letter shows me that Work has made its way into Central India, and is read there by Englishmen and appreciated. "But where is Fig. 2?" some reader may say. "I don't see it here, nor do I find Fig. 1, and as Fig. 2 is mentioned, I suppose there must of necessity be a Fig. 1." True, oh, reader, but the giving of the drawings would have revealed the whole secret of the buckle, respecting which I must, for the writer's sake, preserve a fitting reticence until the invention is safe in port, if it be really a new thing. It is declared to be a patented article, but I do not know that it is patented in this country. When the time comes that the drawings may be safely published, they shall find a place in Work. Meanwhile I shall be happy to show the article itself to any well-known manufacturer of goods of this kind who might wish to enter into communication with the writer with a view to purchase his rights. Men who live at home can have help rendered to them more directly in other ways. I am in sympathy with every inventor who has a good thing to place on the market, and is seeking to make his invention profitable to himself, but much more so with those who are heavily handicapped by distance from the place where buyers and sellers most do congregate, and it is this sympathy which has prompted me in this case to step somewhat out of the beaten course, and to set up a fingerpost to what I believe to be undeniably a "good thing." The Editor.

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SHOP:

A Corner for Those who Want to Talk It.

NOTICE TO CORRESPONDENTS.

**** In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

Steel Distorting.—WORKER BEE writes:—"In 'Shop,' page 476, I observe A. B. C., in reply to a query on this subject from G. H. (*St. Helens*), gives it as his opinion that the steel became distorted in tempering by being heated 'too hot or not dropped perpendicularly into the oil or water to cool it.' May I point out to G. H. that there are many other reasons why his steel became distorted in tempering besides the one given by A. B. C.? The chief and most difficult to avoid is the treatment the steel has been subjected to in forging. If it has received a greater number of blows on one side than the other, or the blows have been given with greater force on one side than the other, although the steel may be straight when dipped into the cooling bath, it is certain to become distorted during cooling in proportion to the inequality in number and force of blows given during the forging process. Not knowing the article G. H. has been making, I will suppose it is a taper steel bar. It has been forged, and now he wishes to turn it in a lathe and afterwards temper it without risk of distortion in the latter process. Let him proceed thus. Having centred it, take a rough cut from end to end in the lathe; now make it a dull red heat throughout, and plunge it into dry slaked lime or charcoal dust, and allow it to cool. When cold take another cut down it in the lathe, and repeat the heating and cooling process. Unless the bar has had extra rough usage during forging, this will usually be sufficient. It may then be finished in the lathe and tempered, and be found free from distortion, but if doubtful, I have seen it heated and cooled the third time before finishing. If the article is flat instead of round, and fitted by grinding or filing, the same process must be observed if you wish to be very accurate. The cause of distortion, you will gather from the above, is the outer surface has become of a closer texture in some places than others, and unless that surface is removed it is certain to contract greater there than elsewhere, when 'cooled' during the tempering process. Without wishing to be hypercritical to A. B. C., I venture to write this, on the principle of 'help one another' that prevails in 'Shop.'"

Incubator.—J. O. K. (*Aylesbury*) writes:—"Will W. L. (*Kingsland*) kindly enlighten me on a few points as to his mode of making incubator? I will put the questions. (1) What size garden pots would he allow for, say, fifty eggs? How does he regulate his heat? He must have a thermometer, considering the thickness of sand the heat must penetrate before it reaches the eggs. (2) Does he close the top of the upper pot to keep the heat in? (3) As the eggs require damping at times, how does he manage that part? (4) Would not two pails answer the same purpose, as one bottom would fit close into the other, and only one piece of tin would be required to fit, or the bottom pail might have a large hole cut so as for the heat to reach the bottom of the upper pail? I have seen the water tank used to heat by steam, but never the arrangement named by W. L."

Home-made Articles.—B. G. S. (*Dover*) writes:—"You seem to have discovered a clever mechanic at last. Have you seen these productions of H. G.'s (*Bishopsgate*) (see page 636), because I can't quite believe in them, though they are said to be made with the aid of a keyhole saw, an iron chisel, and a shoemaker's knife. Not a large tool chest required for those. Why, the dresser rails would have to be turned. What about the rails being decently round. I don't wonder he refused 20s. for it. It must have taken a month to make. And these are all his first attempts! He must indeed be a genius. Is it true? Have you seen the articles, or only his sketches? I can do them that way out of books with a little tracing paper."

Bell Metronome.—R. F. (*Norwich*) writes to FIDDLER (*Glasgow*) (see page 654):—"I would say 'Go it, FIDDLER, there's nothing like asking for enough when you are about it.' His very modest request is something like asking for instructions how to make a clock, and is quite outside the limits of 'Shop.' If I thought it would be of sufficient interest, I would, with the consent of the Editor, get up a paper on the subject, but as the articles in question are very little used except by music teachers, and can moreover be purchased very cheaply, I think it would be using valuable space that might be devoted to subjects more interesting to a larger class of readers."

Purchasing Timber.—A. J. H. (*Brixton, S.W.*) writes:—"I have read with surprise the remarks by A. R. (*Scorrier*) (see page 635). How long has he been in the trade not to have learnt yet that a 2-cut is always understood to be 3—1-in. boards, and a 3-cut 4—¾-in. boards? I am quite aware that they do not measure the exact thickness, but few expect this. In fact, speaking from twenty years' experience, I do not remember more than two or three persons who required a 2-cut deal to cut 3 full 1 in. board. A. R. must be aware that every thickness in the trade is calculated to run the size less the saw cut, and that the only boards that do hold the full thickness are those cut on the 'other side'—*i.e.*, at the mills when the timber is first cut. Of course, if a customer requires a full 1-in. board, a deal can be cut for him, and leave a ¾-in. board off. I presume A. R. must have left his thinking cap at home—that is, if, etc., when he wrote his letter. In writing the article I gave only the trade sizes and expression, so that the amateur could be on a level with the professional in asking for his timber. I may add that I have had the article quoted to me in the yard, thus showing that it has been of some use to the many readers of WORK."

Candlestick.—W. W. C. (*Peterboro'*) writes:—"The enclosed drawing of the raised cup candlestick I send to the editor of WORK to illustrate it in a place in any part of the paper."

Candlestick.

Misuse of Terms—Bookbinding, etc.—H. B. (*Jarrow-on-Tyne*) writes:—"I have repeatedly noticed correspondents use the word bore in relation to metal. Now I always understood that wood was bored, but that metal was drilled. Again, as a practical joiner, I must take exception to the way in which Mr. B. A. Baxter is teaching young joiners how to use the mortise chisel. In the number for December 28, page 647, Fig. 4, I think most practical joiners will bear me out that the chisel is turned the wrong way, and for this reason the chisel as there shown has a tendency to jam the core in the mortise, whereas if used the reverse way the tendency is rather to free the core than to jam it. To refer once more to the misuse of terms, in the part of the country where I served my time (Norfolk) the outer uprights in the framing of a door were always called 'mullions.' Now I find almost invariably in WORK correspondents use the word 'munting'—Mr. Baxter, to wit, in the above mentioned article. Now in the only dictionary I happen to have by me at present (it's only a small one, 'tis true) I don't find the word munting, but I find mullion—a bar in a window frame. Now even that, I think, is scarcely correct. Strictly speaking, a mullion in relation to window frames is the stone or brick upright or column that divides a window opening into two. I would like to correspond with some subscriber who is interested in bookbinding with a view to mutual help. I have carved a piece of mahogany with the word 'Work.' If any subscriber who has facilities for casting small articles in brass would like to have one, I would lend him the pattern if he will cast me one. They are for lettering the back of WORK when bound."

Copies of Fretwork.—F. C. (*Leytonstone*) writes:—"Perhaps the following method of making copies of fretwork designs may be useful to some of your readers. Instead of cutting one piece of wood at a time, clamp two together, and put three or four pieces of paper between them, then cut. The saw will cut the wood, and the paper as well, and as many pieces of paper are used there will be copies of the design. A piece of thin copper or tinfoil may be used instead of the paper, and thus make a stencil plate."

Fret Machine.—SCEPTIC (*Brixton*) writes:—"I notice on page 636 of WORK that A. A. (*Coventry*) has been kind enough to give particulars of a fret machine which he says works well. I should esteem it a favour if he would answer the following questions:—(1) When the frame is down how does he get it up again—he has no flywheel in the illustration? (2) Does it require two people to work it, because the saw frame is parallel with the treadle? (3) If you want to cut the inside of any piece of work, how is it done?"

Blowpipe and Fan.—W. G. (*Cheltenham*) writes:—"As a reader of WORK, and rather an impatient one for every weekly number, I should like to ask A. S. P. what he means by a curve to a radius of twelve inches for a fan. I should esteem it a favour if he would explain it fully for me to understand, as I am making a double fan, and should like to see section of curved fan blower. I understand fully everything else."

Organ Materials.—B. F. (*Birkenhead*) writes:—"There are many inquiries by amateurs for organ pipes and parts. I once started to make one, but it cost too much. I saw one with, I think, four stops and room and holes for more not put together, the case all complete for £7. It stood about 7 ft. high, and was to be seen at Mr. Hall's, 4, Moor Place, Liverpool. He might sell the parts. My advice is, take the lot and fit it up yourself."

Belts Slipping.—B. F. (*Birkenhead*) writes in reply to J. P. A. (*Walthamstow*) (see page 524):—"I use this every day on the boiler or steam chest: Place an old tin with tallow and resin mixed together like glue; not too much tallow. Stir it up, apply hot while in motion, pour on. Put it back when done; it will always be hot and ready. You will find it stick."

Brazing Machine.—A. X. E. (*Nottingham*) writes "that the maker's name of the brazing machine referred to on page 635 is Thomas Duncan, machine maker, 305, Manchester Street, Oldham, and not Duncan and Mills, who are the patentees only."

Cigarette Maker.—C. W. B. (*Plymouth*) writes:—"I have had a cigarette tube made out of a piece of brass tubing in accordance with the sketch shown on page 670, but find it a complete failure for the purpose intended. The ends were left open to allow the stick to pass into the tube. There is evidently a defect by the open space where the tubing is hinged causing the tobacco to jam instead of passing freely through it. My idea is that a thin slip inside would obviate this defect."

A Simple Incubator.—B. F. (*Birkenhead*) writes:—"I have been busy or would have written earlier. Thanks to those who replied to my question *re* a simple incubator (see page 302). Mr. W. L. (*Kingsland*) (see page 557) says cut a piece of tin to connect the two pots together, but he does not show how far up to keep the sand from going below. Won't it burn the flannel? I thought the heat should be above the eggs, not below. The tin could go through, and a hollow tin box on top to throw down the heat. B. A. B. (*Hampstead*) (see page 573)—thanks for your reply. I had seen on dissecting an old Bourdon pressure gauge a hollow horseshoe shape which expanded, telling the steam pressure. I have a plan which I am working on that will turn the lamp off and on for the gas as required, similar to the governors of an engine. This idea I am going to sell, or get a partner and patent it. The whole affair could be made for 2s. 6d. It can be used for anything requiring steady heat, stoves, etc. Did any reader hear of such being patented? It is self-acting on the burner of lamp damper or gas. No chemicals or hollow vessels; cannot get out of order, being so simple."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Colouring Brass Work.—PLUMBER (*Glasgow*).—I find that a beautiful violet colour is imparted to brass work by the application of chloride of antimony. Get the work perfectly bright and clean by the usual methods, either in lathe, or by dipping, etc.; heat it over gas flame or spirit lamp, so that water will steam off it but not fizz, and then apply the chloride of antimony liquor with a piece of rag or pad attached to a piece of wood; when the metal has assumed an even colour polish by rubbing with a soft cloth, perfectly clean and dry, and protect with a coat of clear lacquer. Should you prefer a darker colour use either of the following recipes:—(1) To 1 part oxide of iron, or iron filings, add 1 part arsenic, and 12 parts hydrochloric acid. Dissolve the oxide of iron or filings in the acid, then add the arsenic; strain, and bottle for use. (2) One pint of strong vinegar, 1 oz. of sal-ammoniac, ½ oz. arsenic, ½ oz. alum; dissolve in the vinegar, and bottle. These mixtures are to be applied in the same way as chloride of antimony, and, as you are doubtless aware, the ultimate shade may be varied by treating with various lacquers. In all cases the work should be polished with a dry cloth immediately the desired colour is obtained, and in the case of the two latter recipes the work should be lacquered at once, but with the chloride of antimony this is not essential. With regard to Florentine bronze, I should be glad to hear some other contributor's views upon the subject, as I am not aware of any recipe for a mixture, etc., which will impart the desired red shade, and also a metallic appearance. The only recipe I know of is the following:—The work having been finished bright and clean, is covered with a thin coating of copper. Now make a paste with Spanish brown, 12 parts, and blacklead 1 part, in hot water. Dissolve a small quantity of oxalic acid—say as much as will fit on a sixpence—to ½ lb. of other ingredients, also in hot water, and thoroughly mix the whole; thin with hot water to a workable consistence, and apply with a soft brush. When dry, polish with a medium brush. This done, the work is ready for lacquering, a pale lacquer being employed. I give you this recipe for what it is worth; to my mind it seems like directions for a coat of paint, and hope some one practically acquainted with "Flor" may give us the benefit of his experience.—OPIFEX.

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Spence's Casting Metal.—D. O. (*Blackhill*).—The firm you refer to is not now in existence. Upon hearing from you I inquired of one of the leading London firms in this line, and they reply that they have not heard of the casting metal you ask about for years. There are various alloys which might suit you. Write again and state exactly what your requirements are, and I am sure we shall be able to obtain the information you need.—OPIFEX.

Small Castings.—E. W. (*Petersfield*).—There are several foundries in Southampton where you could get your castings made. If, however, there is anything specially difficult about them, which heavy founders do not care to tackle, and the Editor cares to furnish you with my address, I will, on the receipt of the pattern, get them cast, or advise you if there is any difficulty in the work, and how to remedy it.—J.

Browning Rifle Barrel.—PADDY BROWN (*Belfast*).—To prepare your rifle barrel for browning, all the old colouring, rust, etc., must be removed. To accomplish this rub it down well with emery cloth, and then polish with finest emery and oil until quite bright. Remove all trace of grease by rubbing with quicklime and water, rinse in warm water, and let dry. Plug the muzzle and vent with wood, and avoid handling the barrel. A good plan is to leave the piece of wood with which you plug the muzzle long enough to hold the barrel by during subsequent operations. There are various recipes for browning composition. The simplest is chloride of antimony and olive oil. Add the oil to the chloride of antimony until the mixture is of a creamy consistence; heat the barrel slightly, and apply an even coating of the mixture, and allow it to stand for twenty-four hours, when it will be covered with a fine coat of rust. This is removed with a perfectly clean and very stiff brush. Repeat these operations until the desired depth of colour is obtained. Should you wish to hasten the operation, add a little nitric acid to the browning mixture, when about ten hours will be sufficient for each application. When satisfied with the colour the barrel is washed in hot water, dried, and polished by rubbing with a very smooth piece of hard wood, when it should be varnished with pale lacquer. I need hardly add that every process of this nature requires practice, and that all operations in which chemicals are employed are liable to disappoint the worker, but if the foregoing directions are followed carefully I think I may promise you success.—OPIFEX.

Camera Fittings.—WM. MCM. (*Cupar*).—A lens tube and cap can be procured from almost any lens maker. Lancaster, of Birmingham, or Taylor, of Leicester, would, I have no doubt, supply the want. The price would of course depend on the amount of finish, or if made for single or compound arrangement of lenses with or without diaphragms. If WM. MCM. can work in metal, by the exercise of a little ingenuity he could construct one himself from a piece of brass tube of the right dimensions. The cap is easily made of a disk of thin wood of a suitable size, around which is glued several folds of stout paper. Cover with leather on the outside, and line the inside with black velvet. The cap should fit smoothly and evenly, but not too tight. He might possibly find something to suit him at some dealers in second-hand apparatus. The price of a whole plate lens complete (new) varies according to the maker's reputation from 30s. to £7, and for a portrait combination considerably more.—E. D.

Screen Materials.—BOB (*Sunderland*).—Paper, as you suggest, will do very well for lining the reverse side of your screen, but it should be laid on a calico, or some similar support, or it will be very liable to get torn. You may use almost any fabric instead of paper. If you want a glossy surface you might use oil baize or leather cloth. This you can also get with a dull surface more closely resembling morocco leather. Then there are cretonnes and chintzes in an almost endless variety. Cretonne lining is very good if you want a plain cover. Any of these materials are suitable, but prices vary so much that I cannot give them here. Your best plan will be to go to some good upholsterer or furnishing draper, and tell him what you want. He will quote price, when you can easily calculate the entire cost.—D. A.

Advice as to Trade.—B. R. G. (*Dorking*).—The subject on which you ask advice is, indeed, a serious one, for, as you say, it may affect your whole path in life, and I should strongly recommend you to take counsel with friends who know more of your circumstances and capabilities than I do. At the same time, as a friend who only knows as much of you as your letter tells, I may give you my own views. The most serious hindrance to your learning a trade in the ordinary way is your age, for I do not think any one would take you as an apprentice at twenty-two. You might get some employer who would be willing to take you on for a time with a premium till you had acquired sufficient knowledge to continue with him, or with another as an improver. Your taste for the carpenter's bench, and your familiarity with amateur woodwork, I am afraid, will not be of much use to you in a practical shop. Ability to work well as an amateur is a very different matter from being of the slightest use in a workshop, where a sharp lad, who had worked at the bench for a few months, would probably be of more value than the most skilful amateur. This may seem rough on amateurs, who, as a rule, have great ideas of their own skill; but I do not want to mislead you by giving you the idea that your present knowledge of joinery is likely to be of material aid to you. It may indicate that you have a natural bent for mechanical work, but otherwise it has little or no value. Amateurs are rather too apt to air their skill to the disparagement of others who have practical knowledge, so that on the whole if you want to become a joiner, I think you will do well not to lay much stress on what you can do now. Your employer will soon see what you can do. Many in similar circumstances to yourself have applied to me to be taught practically, most of them because they "have a taste for the business," or "are clever with tools," but such people, I have generally found, know too much to be taught anything. You will take these remarks in good part, I am sure, and not consider them personal further than indicating an error you should try to avoid. The terms for teaching you would have to be entirely a matter of arrangement, and probably before anything could be definitely decided you would have to go on trial for a month or so. If you are sharp and capable, you might be able to secure a small wage from the beginning almost, and if I were in your place I would regard with suspicion, or, if this is too strong an expression, examine with great care, any offer made to teach you if the premium required be a large one. Probably your services would be an equivalent for premium. I do not know what you have been brought up to, but could you not, presuming that you know something of any business, manage to get into some trade in which your knowledge might be of use? Very few men can get into precisely the trade they like, and after all, you know, a man is not always the best judge of the course of life for which he is most suited. Circumstances have to decide for most of us, and you must, to a great extent, be guided by these. I do not know that I can answer your inquiry as to wheelwright or joinery more definitely. They are both good, reliable trades, but if the choice be open to you, I am inclined to think that joinery offers the best prospects, especially if you turn your attention to the finer branches, such as cabinet making. The only way I can suggest for you to put yourself in communication with an employer is to write, or call on him. If you do not know any you might advertise, but the most reasonable way seems to try the local people first. If there is anything more I can tell you, write us again.—D. A.

Postage Stamp Gum.—E. M. (*Ashton*).—I believe dextrine is used for postage stamps, but even if not you will find it an excellent material for similar purposes. It can be obtained from chemists in the form of a powder, which readily dissolves in water. It is very strong as an adhesive, and cheaper than gum arabic, which may be used instead, if you cannot get dextrine.—D. A.

Polishing Fretwork.—A. J. M. (*Gravesend*).—You want "directions how to polish or varnish fretwork that cannot be done with a rubber," and I am sorry to say I cannot tell you, for I do not know of any fretwork which cannot be done with a rubber. Of course, if you varnish fretwork no rubber is required, as the varnish is laid on with a brush. Let us know what the peculiar kind of fretwork is which cannot be finished with a rubber, and then I may be able to help you, and tell you "what material is required to do it with."—D. A.

Varnishing Violins.—T. P. (*Birmingham*).—Violins should not be stained and subsequently varnished, but should be covered with a varnish charged with colour; a camel-hair brush is used for the purpose. Every fiddlemaker has some special "fad" for varnishing, and mine will be explained after the instructions in violin making.—B.

Small Camera.—W. J. A. (*Morley*).—A quarter-plate lens may vary in price from a few shillings to a few pounds, according to the kind and reputation of the maker; excellent lenses may often be procured at very low prices. If W. J. A. does not understand them, it would be as well to get some one experienced in the matter to select one for him. Landscape or single lenses are less expensive than double combination or portrait ones. As to the kind, the work to which they will be put must determine that. The portrait lens works more quickly than the landscape form, but does not possess so flat a field or so much depth of definition; that is to say, objects at different distances are not simultaneously depicted on the focussing screen so distinctly as with the single lens: the principal advantage of the portrait lens is rapidity. With regard to stops, a strip of blackened brass, in which an aperture has been made, and fitting into a slot cut in the lens mount between the lenses, is the most simple form of diaphragm existing. With regard to a camera, a full description of one was given in WORK about two months ago. A camera to be of any use at all must be as good for an amateur as for a professional, or *vice versâ*. One box sliding in another, telescope fashion, in order to adjust the focus, with a lens fitted at one end and a plate at the other, can be made, by one who understands what he is about, to produce good photograph negatives. The principles of negative making are complied with in this simple arrangement.—E. D.

Castings for Rivetting.—CASTING (*Camberwell*).—I could answer your question better if I knew the nature of the articles you require. The cheapest metal of course is cast iron. But unless the castings are tolerably stout and solid, they will not stand rivetting. Malleable cast iron is next best, and will stand rivetting very well, and can be recommended. Send for these to Harrison & Co., Malleable Iron Works, Lincoln. Gun metal will also stand rivetting, but is probably too costly.—J.

Knife Repairs.—H. W. H. (*Anerley*).—Knife blades may be fixed in their handles by putting some powdered resin or shellac in the holes, heating the tangs of the blades sufficiently to melt the lac, and inserting them. When cold they can be as firmly fixed as ever. Brackets and tables for painting will be described, but there is very little fancy furniture which may not be made of pine, and painted. You will find several designs suitable for your purpose in our back numbers. For instance, the two tables described in No. 1 would look well if painted.—D. A.

Photographic Changing Boxes.—TRIPOD.—The matter will receive attention. Changing boxes of the usual type are seldom used now by practical men, the double dark slides being infinitely better from all points of view, as it has been found that much more nicety in cutting the glass for the dry plates and grinding the edges is a necessity with these boxes, as the least inequality in size or roughness on the edges or corners of the plates is apt to disarrange the whole affair, and necessitate a careful examination in the dark room before the apparatus can be made to work. These, with the liability of getting the films imperfect from dust and fragments of glass detached from the plates by the friction of carriage, are such serious drawbacks, that double dark slides of light modern make are better in every respect, and weigh no more, a matter of considerable importance to the tourist, who is jealous of any extra weight unless coupled with corresponding advantages.—E. D.

Connections for Carbons.—A HUMBLE ADMIRER (*Bradford*).—My experience with bichromate batteries goes to show that lead caps cast on the ends of carbon plates make a more lasting connection than copper-electro deposited on them. Paraffin wax is worse than useless as an insulator in the presence of chromic acid. Bore a hole in each of the carbons to make a holdfast for the lead, and cast a lead head to each, in which embed a binding screw of the pattern shown at Fig. 5, page 474. As this is sketched full size, perhaps you can make it yourself. I hope shortly to show exactly by diagrams how to cast lead heads on carbons. Warm the lead caps when finished, and paint them with Brunswick black, allowing this to go well on the carbon below the head for half an inch. Connect to the copper rings above the board, if you choose, by means of copper wires attached to the binding screws.—G. E. B.

Chloride of Lime Battery.—D. D. (*Glasgow*). Why bother your head and myself with scheming out such a hodge-podge battery, when there are so many good and cheap ones already invented and proved? I cannot say how you would succeed with a battery charged with dry chloride of lime in the porous cell with the carbon, for I have never tried it, nor am I likely to do so. Neither should I cement glass plates together to form a battery cell, whilst such cells can be improvised out of any old crocks, providing they are not cracked. Try this as a cheap battery for your bell. Get three small porous pots and three meat tins. Solder a copper wire to each of the tins to form connections. Put in the porous cells, and pack them in with iron turnings from the lathe. Fit an air-tight bung to each cell, and soak it in paraffin wax if possible. Through this bore a hole to closely fit a zinc rod for the positive element. This must not touch the bottom of the cell. Charge both cells with a strong solution of caustic alkali; black potash will do for the purpose. This is not so good as the Leclanché, but it will ring a bell, and is a cheap battery.—G. E. B.

White Lead.—J. G. (*Cottingham*).—Strictly, chemically speaking, white lead is a mixture of carbonate of lead and hydrate of lead. The true oxides of lead, I am well aware, are of a considerably different appearance—for instance, litharge and minium, or, as the latter is most familiarly known, red lead. How far I am chemically justified or incorrect in terming the commodity not oxide merely—as you will notice on reference—but white oxide of lead, it may scarcely be worth while to consider here; but the late noted writer on pigments and colours, George Field, author of "Chromatics," etc., so designates the whites of lead, and I preferred to retain the support of so generally acknowledged an authority (whose works upon the subject formed my earliest lessons on pigments), when briefly explaining the nature of the substance in question, than to repeat the nomenclature of the ordinary cyclopædia. Whether Field was justified by analysis, logic, or usage of his time, I cannot answer, since we know that many oxides have no acidity, and are, therefore, to some extent, misnamed. Space will not allow me to go further into this and other apparently similar instances, but I trust my answer will satisfy you, and be some return for your courteous sentence on the matter.—LONDON DECORATOR.

Green Paint for Venetian Blinds.—G. S. (*Greenock*).—I am not directly acquainted with the methods practised by those who make and paint laths in large quantities, but I have confidence in recommending the subjoined to you. To paint laths two or three coats, and then to varnish afterwards, is a method that scarcely pays where there is competition to be considered. Most large lead and paint manufacturers now prepare enamel paints ready for use for the purposes of coating cheaply ironmongery, machines, implements, etc., and the ordinary mineral-green colour of Venetian blinds is one of the most used articles.

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If you do any quantity it would best pay you to buy some of this, which is usually most satisfactory, and dries in about one hour. Give the new laths first a coat of patent knotting composition, and then finish with two coats of green enamel paint; or if a fine cut and the colour will cover in one good coat, give two of knotting and one of enamel. If you cannot get enamel conveniently, or do not require much, make it yourself, with mineral green ready ground to paste in oil, beat up with cheap, hard-drying varnish, and strain before use. Don't use size instead of knottings! For enamel paint write Pontifex & Wood, Shoe Lane, London, E.C.—F. P.

Safe Locks.—J. A. (*Hull*).—In attempting to open a safe it is always as well to try the bolt with a pick. If the bolt step of the key is worn it will not throw the bolt home, the stump will remain in the gate of the levers, and the bolt can be thrown back with a pick. But if the bolt is fully shot home it is useless trying to open it in this manner. All good safes have lever locks fitted with improvements, which absolutely prevent the possibility of their being picked, so that there is no alternative but to open them in the manner you describe. Should the lock, however, be an ordinary lever one, it could be picked with an instrument similar to that described on page 404. To show that safes nowadays cannot be opened easily, I may mention that early last year a gang of burglars spent the entire night at the Agricultural Hall, Islington, endeavouring to open one, but were obliged to take their departure early in the morning, leaving the unopened safe, and the whole of their tools—to the value of several pounds—behind them. T. W.

Repairing Locks.—W. M. (*Dover*).—Your query is rather a difficult one to answer, as there are such an enormous number of patents in door furniture. Is there no patentee's name on it? If the rose is fixed with wood screws which are visible, take them out, and possibly the knob will come off with it; this is called Pitt's patent, and is in very general use. If there appears to be no fixing for the rose, try to unscrew it, and if you succeed in doing so, you will probably see how the knob is fixed to an inner rose, some by means of a fork that secures the knob to the rose that is fixed on the door, while others revolve in a collar. If you are still unable to remove them write again, and try to give more particulars.—T. W.

Glaze for Porcelain.—W. B. (*Holloway*).—It is difficult to give a definite receipt for this purpose without knowing what kind of porcelain is to be glazed, and what special result is desired. There are many glazes—transparent, opaque, and coloured. For hard or true porcelain we believe the only glaze employed is ground felspar or Cornish stone, with sometimes gypsum added. For soft or tender porcelain the common glaze is of much the same materials as those which form crystal glass—viz., flint, alkali, and about ¾ oxide of lead. The glaze for what is styled English porcelain (that in which there is a considerable admixture of calcined bone) is an intermediate one, felspar with about ⅓ of lead. Oxide of tin, etc., render the glaze opaque, and other metallic oxides will give it various colours. Indeed, the variations which may be made in glazes for various purposes are almost endless. The method of using them is by reducing the material to a fine powder, mixing this with water to a thinnish paste, and dipping the article to be glazed into it, which to give a uniform coating of glaze needs to be done skilfully. The parts by which the article is held need to be glazed over with a camel-hair pencil. The articles have, of course, to be fixed afterwards. —M. M.

Watch Wheels.—C. C. (*Chippenham*).—You can get any clock wheels to order or pattern from Grimshaw & Co., 35, Goswell Road, Clerkenwell, or J. Hunt, 21, Ironmonger Street, St. Luke's, or better still from J. Mayes, 55, Red Lion Street, Clerkenwell.—A. B. C.

Transfer of Lithographs.—In answer to YOUNG CABINET MAKER, several so-called "secret" methods of transferring lithographs, drawings, woodcuts, etc., to wood are practised. Our correspondent, like most of those who ask us questions, does not give us full enough details as to the kind of process he wants to try. The word lithograph embraces so many sorts of printing that we scarcely know how to reply to the query. We can thus only deal in generalities. If the paper upon which the lithograph is printed be steeped in strong isinglass, care being taken to sponge it off the ink all over its surface with methylated spirits, it should be then dried. The surface of the wood should be then glass-papered with No. 1, and finished with No. 0, and sponged over with hot (not boiling) water, and left to dry. This will swell up the grain. Then paper first across, then with the grain, with No. 0. Repeat this, and finish by applying with a soft rag methylated spirits, which let alone till it is evaporated, and paper off again with No. 0 with the grain. Then with japan gold size let down with "turps" so that it may be laid on rapidly and flat so as to show no brush marks with a flat camel-hair brush, similar to those used for damping letter-copying books. Leave it until it is "tacky" enough for gilding, then lay the lithograph face downwards upon it, and rub it till it sticks all over, and let it stand several hours. When thoroughly set, moisten the back of the paper with very hot water (not boiling) and rub away all the paper. The ink alone, being greasy and therefore insoluble in water, will be found adhering to the gold size after all the paper is rubbed away. Give the wood either a coat of mastic varnish or French polish; with white (colourless) lac polish spirit off, and the work is finished. White of egg may be substituted for isinglass, and for light-coloured woods, such as pine or satinwood, Venice turpentine and Canada balsam, two parts of former to one of the latter, should be used instead of gold size. If "transfer lithographs," such as are sold for decorative purposes, are used, a very thin coating of gold size will suffice, and the paper when moistened through with cold water will peel off, and the transfer remain on the wood ready for a coat of varnish or French polish as before.—J. W. H.

A Complaint.—C. H. (*Bloomsbury*).—I know fully what I am talking about when I describe plane patterns. A sensible man would have pointed out the errors into which he supposed I had fallen, but my haughty critic only sneers and snarls, and does not condescend to particular facts. Therefore all I can do is to challenge him to point out my errors. If he will name particularly any example or examples whose description he deems unpractical, or inaccurate, or misleading, I will send patterns, core boxes, and castings of such particular examples to the editor of WORK for his inspection and verdict. Beyond this I will not waste words.—J. H.

Steatite Burners.—H. W. L. (*Ealing*).—I am not aware of any manufactory of these in England, the English market being mainly supplied from the Continent—notably Nuremberg in Germany. The principal factory there has a representative house in London—Messrs. Falk and Stadleman, Farringdon Road, E.C.—who would undertake the making of any experimental work, however small; but, as I gather from your letter that you can use a lathe, why not make them yourself? Steatite is identical with soapstone used by tailors to mark lines for cutting out cloth, and is easily worked, and may be bored, turned, planed, and polished like a piece of wood. When in the form of a powder it is termed French chalk. There are not two sorts, as you suppose—hard and soft; in the raw state it is soft; when baked it is hard and brittle. You would require to get some of the material in the lump, and proceed exactly as though you were making a burner out of a piece of wood. When made submit it to a gradual heat (the kitchen oven will do) until it becomes a whity-brown colour, and perfectly hard. Of course in that state you can no longer manipulate its shape.—C. M. W.

Books for Laundry Men.—FITTER (*Walsall*).—In the October 5th number of WORK, page 459, the names of a few books likely to be of use to laundry men are given, among which are "Stationary Engine Driving" (by Reynolds, 4s. 6d.), "The Safe Use of Steam" (6d.), and "A Treatise on Steam Boilers" (by Wilson, 6s.). I should feel very gratified if you would (through the medium of 'Shop') kindly give the price of each and where to be obtained.—[Prices have been added as requested, and all are published by Crosby Lockwood & Co., Stationers' Hall Court, London.—ED.]

Conducting Wire.—F. S. (*Bermondsey*).—The meaning of the wire, which is shown in Fig. 1 in the article on the "Construction of the Telephone Running to Earth," is sufficiently explained in the text. But as it is sometimes difficult to understand little things I will endeavour to give you a little more explanation. To get work done of any kind by electricity we must have what is called a "circuit." Now a circuit is a conducting wire going to the work from the source of production, and returning from the work after that has been accomplished to the original source. Shortly after the invention of the telegraph it was discovered by Steinheil that the earth could be used as the return. So for convenience sake, and also to effect an economy in wire, instead of running two long wires—viz., from the battery to the work and back again—one long wire only is run connecting the battery and the work called the "line," while from each end a short wire is run to the nearest gas or water pipe, thus connecting them to the earth. Telephones made as described in the article do not require a battery in the circuit unless a microphone is also used, so the two wires either run directly to the pair of instruments, or to the earth, as shown in Fig. 2, not to a battery. You might profit by reading the article again.—W. D.

Pedestal Sideboard.—J. H. B. (*Manchester*).—The firm you refer to is Messrs. C. Gibbons & Co., 2, Avenell Road, Highbury, London, N. Their "bead router" was described in No. 17 of WORK, page 267. All the back numbers of WORK are in print, and can be obtained through any bookseller or newsagent. Regarding quantity of timber for the sideboard you contemplate making, I can only give you these approximately for your small sketch, though an assistance is not sufficiently defined to enable me to tell exactly. The only way you can ascertain exact quantities is to take the measurements from working drawing, but no doubt the following will be of assistance to you:—

52	feet	1	in.	stuff for top, lining, door frames, ends, back frame, etc.
8	,,	¾	,,	,,	pediments, mouldings, etc.
15	,,	½	,,	,,	door panels, etc.
12	,,	¼	,,	,,	drawer bottoms, etc.
32	,,	1	,,	,,	pine, for shelving, bearers, etc.
46	,,	½	,,	,,	back.

From this quantity, allowing for a fair amount of waste, you ought to be able to make the sideboard, but, of course, a good deal will depend on the way you cut your stuff up. The quantities might also be considerably altered, and in fact everything may be summed up by saying that till the working drawing is made out you can't arrive at an exact specification. As one example of how you might considerably alter the above I may remind you that the first item, 52 feet, might principally be of ½-in. stuff. You would also save a good deal by facing the front of the back frame and veneering the sides—*i.e.*, of the back. To go into all the details which you might alter would require a few pages of WORK, but I dare say enough has been said to assist you. Your sketch does not show any rail or glass framing just above the top—*verb. sap.*—D. A.

Staining and Varnishing Cabinet.—E. J. (*Leith*).—I am glad to hear you have succeeded so well in your first attempt, but it is a pity you have used such a mixture of woods if you wish to stain your cabinet walnut or mahogany colour. Owing to the different colours of the woods, you would, as a novice, experience a great difficulty in securing anything like uniformity, for you will readily understand that to get the teak and butter-nut woods to the same tint would require careful and experienced manipulation. A really expert polisher might manage, but I fear you would be disappointed with the result were you to attempt to stain as you suggest. However, if you wish to try I should advise you to stain walnut colour rather than mahogany. Go over the wood with the walnut stain of Vandyke brown ammonia and water, then when dry either polish or varnish. A far better way will be to ebonise your cabinet, as the different woods used will not be apparent, and you will have little difficulty in getting a uniform appearance. You had better buy the black stain, as it will cost you no more than to make, and there will be no difficulty in procuring it in your neighbourhood. Go over the wood with it once or twice, allowing each wash to dry before repeating. You may then varnish, using a hard varnish, which may be improved by adding some gas black. Strain through muslin. It will save varnish if you size over the surface before applying it, but whether you use size or not, if the varnish, when dry, seems to have sunk, leaving a patchy surface, give another coat of varnish. Possibly the wet stain may have caused the wood to become rougher looking than you like. If so, rub down with fine glass-paper before varnishing. When the varnish is dry you ought to have a glossy surface, not so smooth and fine as if it had been well French polished, but sufficiently good for a first attempt at cabinet making, and probably better than it would look if you had tried your first attempt at French polishing it. If you want to get the dull black surface so often seen on ebonised furniture, all you have to do is to brush it lightly, or even rub it down with a little fine emery powder. Brush in the direction of the grain. You will see the brilliancy is quickly removed. Of course the varnish must be quite dry and hard before you attempt to "dull down."—D. A.

Electric Light for Photo Dark Room.—G. E. S. (*Berkeley*).—No other apparatus beside that described on page 445 will be needed. The cost per hour will be 1½d. per cell of pint size. No. 18 wire will do to connect the lamp with the battery if the distance is not over 12 feet. If over this No. 16 will be better. Lead caps, holding binding screws, must be cast on the carbons, and binding screws fixed to the zincs for convenience in connecting up. I hope to fully illustrate and describe this battery in my articles on "Model Electric Lights."—G. E. B.

Glass for Overmantel.—J. G. W. (*Stratford*).—As you are not "connected with the trade" you cannot do better than get what glass you want from any cabinet maker of good repute. If you are ever in the neighbourhood of Shoreditch you might see what Mr. Vincent, Rivington Street, can do for you. You must make your own arrangements about price, which, as you do not give sizes of plates, I cannot even form an idea of. The rate per foot varies considerably, increasing according to superficial measurement. Read the answer to PEDAGOGUE, who also inquires about looking glass. —D. A.

Looking Glass for Bookcase.—PEDAGOGUE (*Aldershot*).—As you want the name of a London house supplying looking glass, I give you one, Andrew Gibson, Garden Walk, Great Eastern Street, E. C. I do not know, as he is a wholesale man, whether he will care to supply you with such a small piece as you want, and if he does you must not expect to get it at a wholesale price. So far as my own experience goes *bonâ-fide* wholesale houses do not care to be bothered with small retail orders. Your best plan is to get what you want from one of the leading cabinet makers in Aldershot. I do not think any of them do their own silvering, but they are constantly getting glass down from the wholesale houses who supply them. Of course, they get a profit, but you would not buy at the same rate that they do, so that by the time you had paid carriage on single plate, including case, and cost of this or return carriage, you would probably find that by ordering direct the expense to yourself would be much greater than if you went to a good local tradesman. The cost of mirrors varies considerably according to quality of glass and silvering, but you may reckon on yours costing 6s. or 7s. If it costs more it does not necessarily follow that you have been overcharged.—D. A.

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Camera Fittings.—P. A. C. (*Hornsey*) will be able to procure camera fittings of all kinds from Henry Park, 1, Orchard Buildings, Acton Street, Kingsland Road.—E. D.

House for Watches.—SCOTY (*Leith*).—The most reliable people who are makers, not mere dealers, are Messrs. T. Russell & Sons, Church Street, Liverpool. They do an immense trade, and turn out a well-finished article, be it a silver lever or a gold chronometer.—J. S.

Repairing Verge Watch.—W. K. (*Leeds*).—You misunderstand my words. I say "for repair, see last chapter;" I ought to add at end of watch, and how to clean it. I did not say "previous chapter." You must learn to take to pieces, and clean before repairing, or it will be like trying to learn to read before mastering the alphabet. You must not clean watch plates with oil; do as I say, or when bright touch the brush in rouge, and give a few sweeps in a circular motion; by using oil you cannot expect but to have a dull appearance.—J. S.

Stain.—FRETWORK (*Oldham*).—I suppose you refer to the common fret cut and carved brackets, etc., which are made on the Continent. I do not know the particular stain used, if indeed there is a general one. Probably there, as here, different preparations are found. The colour, as you know, is walnut, and you cannot do better than use any of the ordinary walnut stains. One of the simplest and best has already been several times referred to in these columns. It consists of Vandyke brown, ammonia, and water.—D. A.

Re-staining Bookcase.—G. B. (*Leeds*).—I am not acquainted with the "Castle Brand walnut stain," but having used it on a piece of pine furniture which you now wish to stain and polish in imitation of mahogany, I should think you must clean it off before you can do so satisfactorily. A good deal, however, depends on the darkness of your present stain, for if this is only of a light walnut colour, you will probably get the effect of a dark mahogany by using a red polish over it. To get a good mahogany colour on pine furniture you cannot do better than adopt the method above given, being careful not to make the wood too dark with the walnut stain.—D. A.

Address and Moulding.—J. H.—Secretary of London Association of Foremen Engineers and Draughtsmen, W. Smith, 101, Thomas Street, South Hackney. Meetings held in Cannon Street Hotel. There is a similar society in the Yorkshire district, but I cannot give particulars. Articles such as you mention are in course of preparation.—J.

Burnisher.—W. H.—No book specially on the subject, but consult Holtzapffel's "Turning and Mechanical Manipulation," Vol. 3, page 1042.—J.

To Mount Tracings.—J. E. J. (*Middlesborough*).—Prepare a flat straining frame the size you desire your mounted tracing to occupy. Then cut some calico just large enough to cover it and to fold over the back to the extent of one inch. Damp this slightly, paste edges, and fix on strainer. When dry it will strain quite tight. The next operation requires the most care. Damp your tracing either with a sponge or by steaming it, but be careful the colours do not run. Then paste round one inch of the edges (of course at the back), then fix on the calico. The best way I find to do this is to put your damped drawing face downwards on your bench, paste edges as directed, then lay your covered strainer down on the drawing. Taking it up press round the pasted margin carefully with clean hands or linen cloth, but beware of finger marks, and in damping do not deluge, and take care that colours do not run.—F. B.

Book on Painting.—E. M. J. (*Ipswich*).—You had better advertise for a second-hand copy of the book in question.—ED.

Telephone Fittings.—CURIOUS (*Belfast*).—I am very pleased to have your letter. It shows considerable acquaintance with the subject, and I am quite delighted to be able to set you right. I hope you will succeed in getting your telephones to work properly. As you have numbered your questions, I will answer them in rotation. (1) In Fig. 4 you will observe two little articles lettered respectively A and B. A is a binding screw, which is shown at B in Fig. 1. and has no connection with Fig. 8. B is an adjusting screw, which has a neck wrongly shown screwed in the figure. This neck fits into the brass collar, Fig. 8, which is itself screwed to the top of the body of telephone. The screw fits into the S end of the magnet, and the whole is for the purpose of adjustment. The arrangement which you have described and are going to adopt will do just as well. (2) The bobbins can be made of boxwood, and the spindle part must be very thin—in fact, it is no thicker than paper. I was showing one to a friend the other evening, and I could easily squeeze it out of shape between my fingers and thumb. (3) It is not necessary to insulate each layer of wire on the bobbin with paraffin paper. The depth of the bobbins may be seen from Fig. 1. It is not necessary to have them any particular size. Make them to fit the end of the magnets, and to hold a ¼ oz. of wire No. 36. (4) You can have a bell in the circuit with the telephones, but you must have a battery or a generator of some kind to work the bells. In a circuit arranged with bells you would also require a transmitter. (5) Certainly rig up your telephones with a battery, and dispense with the earth wire. This wire is the return wire, and is only connected to the earth through the means of a water or gas pipe for the sake of economy. (6) You understand the microphone perfectly. It is as you say two pieces of wood joined at right angles, and three pieces of carbon. The two end pieces are just fastened to the upright in the most convenient manner, so as to get a connection. I think Fig. 6 explains it fully. Fig. 11 shows the connections.—W. D.

Painting Magic Lantern Slides.—P. M. C. (*Finsbury Park*).—In answer to your question "Can you tell me how to paint lantern slides with water colours?" I can here only give you a few hints. The glass must be perfectly clean, and of special quality. Give the glass a very thin even coating of finest sheet gelatine dissolved in warm water. This may be done with a flat camel's-hair brush, or let gelatine form jelly, heat the glass, and rub with jelly. The colours to be used are the ordinary moist water-colour paints in pans or tubes, but in slide painting you are restricted to the use of the transparent pigments—viz., Prussian blue, indigo, gamboge, carmine, crimson lake, Italian pink, sap green, ivory black; the semi-transparent colours are sepia, burnt sienna, Vandyke brown, and burnt umber. This is not a full list, but will serve as a guide as to the choice of pigments. Lump sugar dissolved in water to form a syrup is about the best vehicle for mixing and thinning the colours. Ox-gall may be used to make a refractory colour take upon the glass. Use camel's-hair brushes, except for the very finest work, when a sable pencil will suit best. Do not try to give a second wash or put in shades without giving the slide a thin even coating of collodion, applied by pouring upon the centre of the glass, letting it run all over, and then draining off at one corner into bottle. The compound colours, such as purple, violet, greens, browns, greys, etc., may, of course, be produced by combining the colours mentioned above. When the picture is finished it should receive a thin coat of best mastic varnish.—OPIFEX.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Gilding on Satin.—S. H. (*South Norwood*) (see page 637) writes:—"On white satin, etc., size spoils the look, and gold size, oils, varnishes, etc., all spread. But if you could explain how it could be done, and some people know the way, it would oblige some of your readers."

Glue.—A SUBSCRIBER asks:—"Can any reader give me the name of the maker of glue with the trade mark on—a dragon standing up against a shield?"

Book on Sheet Metal Work.—L. P. (*Deal*) wishes to know the publisher of a book on the above subject written by H. Warne.

Furniture Cream Bottles.—T. B. (*Rochdale*) repeats his question:—"Will any of our kind readers of WORK give me the name and address of any firm of glass bottle makers where I can obtain furniture cream bottles from, such as are retailed at shops when filled at one penny each?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Fairy Bells.—R. F. (*Norwich*) writes in reply to SUBSCRIBER (*Bristol*) (see page 654):—"I will send particulars of the interior of fairy bells in a short time."

Spence's Metal.—H. J. L. J. M. (*Ealing*) writes:—"In answer to J. S. B.'s (see page 541) query as to Spence's Metal, I think I am right in saying that it is a combination of sulphur and iron in the shape of fine dust or filings. The metal is used for fixing railings in their sockets (just like sulphur pure and simple) and for fitting grindstones on to their axles. The compound is much cheaper than lead, and melts at a very low temperature. I have a small grindstone that was mounted for me in this way by the friend from whom I learned the nature of the metal. Like most sulphur compounds it has a very evil smell, and it is better to melt it out of doors. At the present time I have some small pieces by me, and if J. S. B. cared to write to me through the Editor, I should be glad to send him a piece. By the way, the addition of iron to the sulphur seems merely to change the colour of the sulphur to a dark slate-coloured black, as the compound, when it cools, seems to have the same shaped crystals on its surface as pure sulphur has."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—P. E. (*Ebbw Vale*); REGULAR READER; G. H. (*Congleton*); R. H. (*Birmingham*); YOUNG ENGINEER; G. P. (*Elgin*); GAMMA; ONE INTERESTED; LANE (*Nottingham*); C. H. L. B. (*South Shields*); PAINTER; T. H. D. (*York*); R. L. (*Liverpool*); CREST; J. H. (*Crewe*); PEEPING TOM; J. B. (*Tiverton*); V. A. H. (*Hackney*); J. A. C. (*Plaistow*); H. J. A. (*Dover*); M. S. G. (*Oldham*); W. R. (*Oswestry*); SLIGHTED; A. H. F. (*Cheltenham*); AJAX; BOMBARDIER; J. H. M. (*Ashfield*); F. C. (*Stockwell*); J. B. B. (*London, S.W.*); W. H. M. (*Burgess Hill*); J. G. (*Tottenham*); J. L. W. (*Biggleswade*); W. H. B. (*West Hartlepool*); W. Y. (*Enfield Lock*); B. J. (*London, W.*); J. S. (*Birmingham*); S. B. (*Exmouth*); W. D. G. (*Lowerfold*); R. M. C. (*Gravesend*); NEW SUB.; BOATHOOK; W. A. E. (*Manchester*); A. P. (*Wigan*); G. E. D. (*Watlington*); W. N. (*London, E.*); S. S. (*Nottingham*); W. H. D. (*London, N.E.*); H. J. (*Bristol*); M. S. (*London, E.C.*); J. J. D. (*Bournemouth*); H. H. (*Stapleford*); J. W. R. (*Cockermouth*); G. M. (*Berlin*); J. T. H. (*Sheffield*); T. W. (*Bradford*); CROSS; WHIT (*Shipley*); I. H. J. J. (*Birmingham*); RESTORER; A. A. (*Liverpool*); M. R. (*Burnley*); A. and N. (*Battersea*); E. R. S. (*Stroud*); M. A. G.; W. B. S. (*Nottingham*); W. S. C. (*North Shields*); D. O. W. (*Ipswich*); CORE-BOX; I. B.; NOLI (*Glasgow*); ZINC-RODS; L. M. (*Roscrea*); ANXIOUS; L. B. (*Upper Sydenham, S.E.*); W. R. C. (*Falmouth*); T. W. S. (*Orkney*); WORKER BEE; A. B. C. (*London, E.C.*); C. C. B. (*Watford*); W. E. R.; T. W. A. (*East Dulwich*); A. P. (*Stockport*); M. R. (*Glasgow*); LIGHT OAK; I. H. N. (*Worcestershire*); PATIENCE; BRITANNIA COMPANY.

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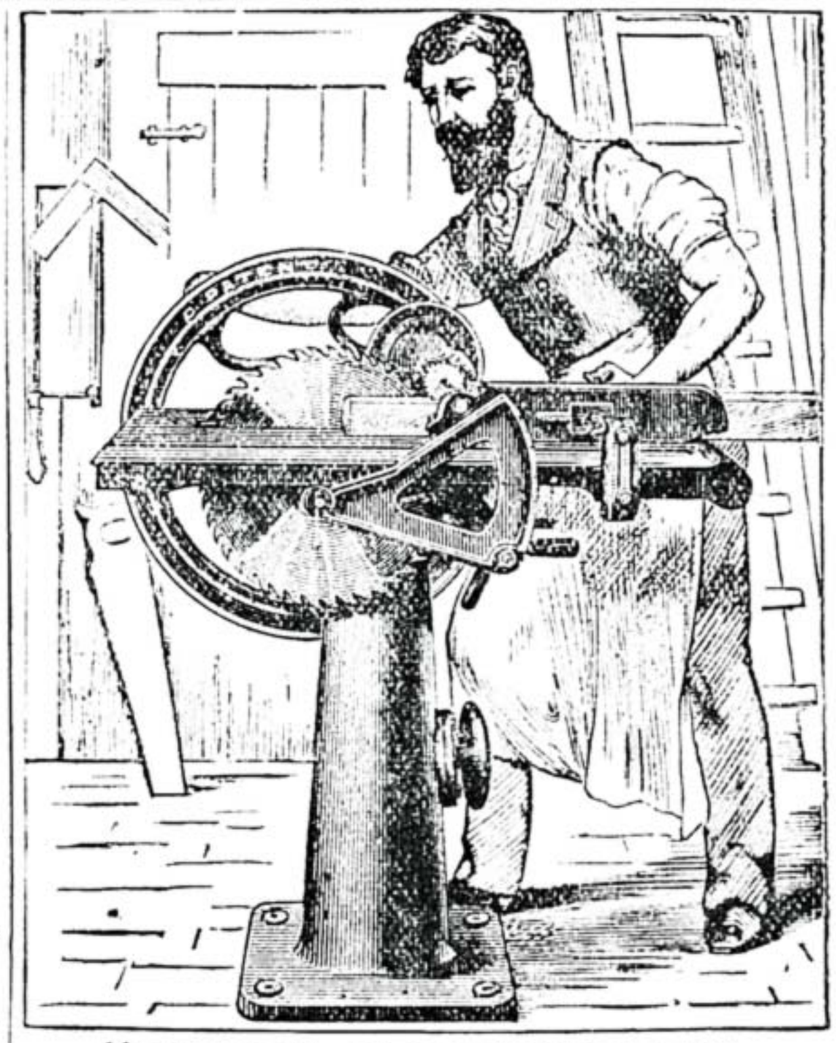

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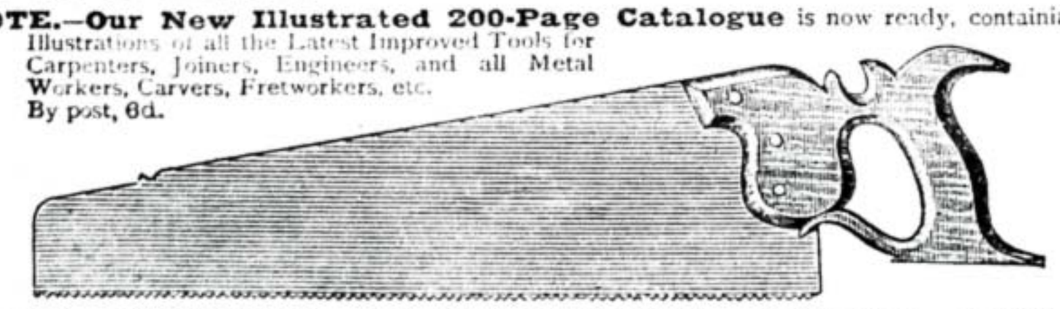

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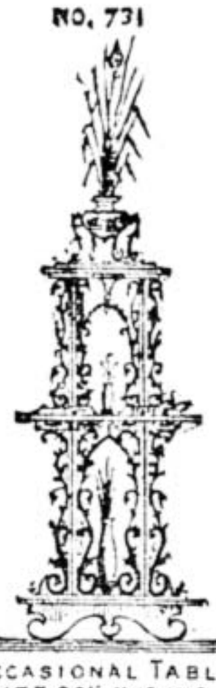

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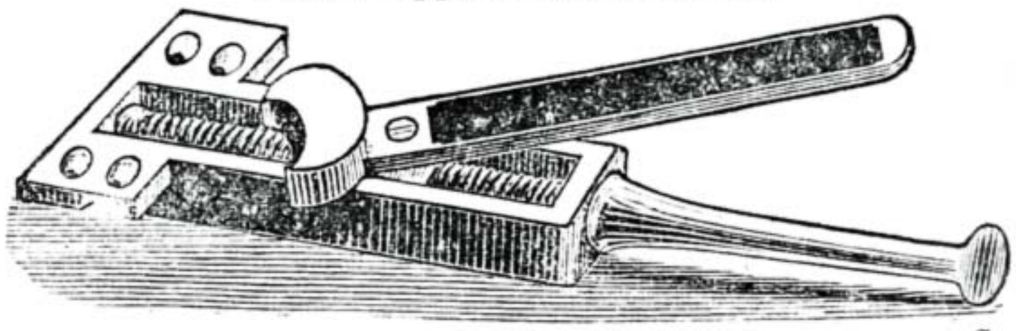

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